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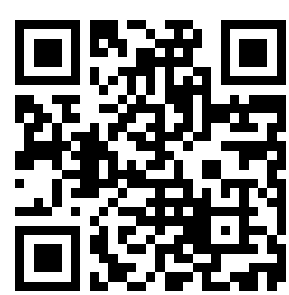

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Matthew Fontaine

# LIEUT. MAURY'S INVESTIGATIONS

OF THE

# WINDS AND CURRENTS OF THE SEA.

(FROM THE APPENDIX TO THE WASHINGTON ASTRONOMICAL OBSERVATIONS FOR 1846.)

PUBLISHED BY AUTHORITY OF

HON. WILLIAM A. GRAHAM,

SECRETARY OF THE NAVY;

AND OF

COMMODORE LEWIS WARRINGTON,

CHIEF OF THE BUREAU OF ORDNANCE AND HYDROGRAPHY.

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NATIONAL OBSERVATORY,
FEB. 1851.

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# WIND AND CURRENT CHARTS.

*To Hon. Wm. A. Graham, Secretary of the Navy.*

JANUARY 22, 1851.

THE hydrographical duties of the office have commanded much of my time, and have received a large share of my attention.

Having been authorized so to do by the chief of the Bureau of Ordnance and Hydrography, whose enlightened policy with regard to all matters of hydrographical import, challenges commendation from all the friends of philosophical research, I employed George Manning, of New York; A. H. Bancroft, of Boston, and Capt. Daniel McKenzie, of New Bedford, an old experienced but retired whaling master, to procure from ship-owners, retired sea captains and others, old sea journals; and to copy from each, the position of the ship daily in latitude and longitude; the force and set of the currents; the temperature of the air and water; the prevailing force and direction of the wind three times a day, or once for every eight hours; the height of the Barometer; the state of the weather; with remarks upon all subjects calculated to be of interest to the practical navigator.

For every day for which these gentlemen afforded such a record, whether in the Atlantic, Pacific or Indian Ocean, they were paid at a rate varying from one to two and a half cents per day's record.

In this way a large mass of materials for the Wind and Current charts was obtained. The copyists were required to note, also, in these abstracts whenever the appearance of whales was mentioned in the log.

With these materials on hand, the labor of collating them commenced.

It was made the duty of one set of officers to construct a series of charts, and of another set to project on those charts the tracks of the vessels whose log books were under discussion, and to describe by symbols the force and direction of the winds and currents daily encountered by each.

These charts are numbered A of the series. They are the "Track Charts," and have been published for the North Atlantic, in eight large sheets, and a part of the South Atlantic. The rest of the South Atlantic is in press; and the remaining numbers of this series, both for the Indian and Pacific oceans, are in process of construction. They are on a scale of 0.8 in. to a degree at the Equator.

The different sheets of this series show at a glance the frequented and unfrequented parts of the ocean; and inform the navigator as to the general character of the wind and weather, the force and direction of the currents encountered by those who have preceded him in the same part of the ocean, and at the same season of the year.

I have obtained* a list of arrivals at San Francisco from the Atlantic ports of the United States and Europe, up to the middle of December, 1850. Taking the shortest passage for each month by American, English, French and Dutch vessels, we find that the American vessels which arrived there after the shortest passage in

*San Francisco Herald, Jan. 1, 1851.

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May, June, July, September, November and December, had each these charts on board. Of the vessels thus furnished, the shortest passage was by the Sea Witch in 97 days, the average of the six being 114 days.

The shortest of the other six which did not have the charts was 119 days, and the average 128.

Mean average taking the shortest passage only for each month:

| | | | |
|---|---|---|---|
| For | American | vessels, | 122 days. |
| " | English | " | 167½ " |
| " | French | " | 182¾ " |
| " | Dutch | " | 190½ " |

The average passage of *all* the American vessels that arrived during the year is 187½ days, i. e. 73½ days longer than the mean of the 6 shortest passages with the charts on board; 59½ longer than the six shortest without the charts—20 days longer than the average of the 8 shortest by English; 4¾ days longer than the 8 shortest by French, and 3 days shorter than the mean of the 7 shortest passages by Dutch vessels.

These charts are highly prized by practical navigators, and are eagerly sought after by them.

This series as far as published is the work of Lieut. Whiting, Passed Midshipmen Wyman, Gibbon, Beaumont and Temple, and of Professors Flye and Benedict, all of the Navy.

Those marked letter B of the series, are illustrative of the trade winds and the regions of calms and monsoons contiguous thereto. They are constructed according to a peculiar system of engraved squares.

This series, published only for the Atlantic, shows that the N. E. trade winds occupy a belt or zone extending in length from East to West across that ocean, having a variable breadth of from 17° to 35° of latitude. Its average mean breadth is about 23°; and in its extreme range it extends from 3° South to 35° North, according to the season of the year.

This zone makes two vibrations in a year. It reaches its extreme northern declination usually in September. Then returning and following the Sun, it reaches its southern extreme in March and April. Being stationary for two or three months, between 3° and 4° North it commences to return North, and in the months of August, September and October, its other stationary period, it is seldom or never found to the South of the parallel of 9° N. The parallel of 9° N. may be taken as the mean limit of the equatorial border of the zone of N. E. trades.

The S. E. trade winds occupy a similar zone in the South Atlantic, with a like vibratory motion. The mean equatorial limit of this zone instead of being near the parallel of 9° South, to correspond with the zone of the Northern hemisphere, is in about 3° North.

It is a remarked phenomenon, discovered in the course of these investigation, that the S. E. trade winds blow with more force than do their congeners of the Northern hemisphere. They have force enough to push the latter with their belt back towards the North, intruding occasionally in the late summer and in the early fall months as far as the parallel of 9° North. Whereas, out of many thousands of records examined, it does not appear that the belt of N. E. trade winds is ever found to cross the parallel of 3° South.

The two zones of winds are characterised by a like difference of strength in the Pacific. The S. E. trade winds of the Atlantic ocean have force enough to push their equatorial limits over into the

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Northern hemisphere, and to keep them there during the greater part of the year. The reverse is never the case.

The prevailing direction of what are called the N. E. trade-winds is, as nearly as the observations which mariners usually furnish, enable me to determine, about E. N. E.

By resolving the forces which it is supposed are the principle forces that put those winds in motion, viz: calorific action of the Sun and diurnal rotation of the earth, we are led to the conclusion, that the latter is much the greater of the two in its effects upon the trade winds of the Northern hemisphere. But not to such an extent is it greater in its effects upon those of the Southern. We have seen that those two opposing currents of wind are so unequally balanced that one recedes before the other, and that the current from the Southern hemisphere is larger in volume; i. e., it moves a greater zone or belt of air. The S. E. trade winds discharge themselves over the Equator; i. e., across a great circle into the region of equatorial calms; while the N. E. trade winds discharge themselves into the same region over a parallel of latitude, and consequently over a small circle. If therefore we take what obtains in the Atlantic as the type of what obtains entirely around the earth, as it regards the trade winds, we shall see that the S. E. trade winds keep in motion more air than the N. E. do, by a quantity at least proportional to the difference between the circumference of the earth at the Equator, and the circumference of the earth at the parallel of latitude of 9° N. For if we suppose that those two perpetual currents of air extend the same distance from the surface of the earth and move with the same velocity, a greater volume from the South would flow across the Equator in a given time than would flow from the North over the parallel of 9° in the same time; the ratio between the two quantities would be as rad. to the sec. of 9°. Besides this, the quantity of land lying within and to the North of the region of the N. E. trade winds is much greater than the quantity within and to the South of the region of the S. E. trade winds. In consequence of this the mean level of the earth's surface within the region of the N. E. trade winds is, it may reasonably be supposed, somewhat above the mean level of that part which is within the region of the S. E. trade winds. And as the N. E. trade winds blow under the influence of a greater extent of land surface than the S. E. trades do, the former are more obstructed in their course than the latter, by the forests, the mountain ranges, unequally heated surfaces and other such like inequalities.

As already stated, the charts show that the momentum of the S. E. trade winds is sufficient to push the equatorial limits of their northern congeners back into the Northern hemisphere, and to keep them at a mean, as far North as the 9th parallel of North Latitude. Besides this fact, our investigations also indicate that while the N. E. trade winds, so called, make an angle in their general course of about 23° with the Equator (E. N. E.), those of the S. E. make an angle of 30° or more with the Equator (S. E. by E.) I speak of those in the Atlantic: thus indicating that the latter approach the Equator more directly in their course than do the others, and that consequently the effect of the diurnal rotation of the earth being the same for like parallels, North and South, the calorific influence of the Sun, exerts more power in giving motion to the Southern than to the Northern system of Atlantic trade winds.

That such is the case in nature is rendered still more probable from this consideration: all the great

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deserts are in the Northern hemisphere, and the land surface is also much greater on our side of the Equator. The action of the Sun upon these unequally absorbing and radiating surfaces in and behind, or to the Northward of the N. E. trades, probably tend to retard these winds, and to draw large volumes of the atmosphere that otherwise would be moved by them, back to supply the partial vacuums made by the heat of the Sun, as it pours down with such intensity its rays upon the vast plains of burning sands and unequally heated land surfaces in our overheated hemisphere.

The charts show that the influence of the land upon the normal directions of the wind at sea, is an immense influence. It is frequently traced for a thousand miles or more out upon the ocean.

For instance: the action of the Sun's rays upon the great deserts and arid plains of Africa, in the summer and autumnal months, is such as to be felt nearly across the Atlantic ocean between the Equator and the parallel of 13° North. Between this parallel and the Equator the trade winds are turned back by the heated plains of Africa, and are caused to blow a regular Southwardly monsoon for six months.

This monsoon is a discovery which has been fully and completely developed by the charts and the investigations connected with them. They (the monsoons) blow towards the coast of Africa from June to November, inclusively. They bring the rains which divide the seasons in these parts of the African coast. The region of the ocean embraced by the monsoon is cuniform in its shape, having its base resting upon Africa, and its apex stretching over 'till within 10° or 15° of the mouth of the Amazon.

Indeed, when we come to study the effects of South America and Africa, (as developed by these charts,) upon the winds at sea, we should be led to the conclusion—had the foot of civilized man never trod the interior of these two continents—that the climate of one is humid; that its valleys are for the most part covered with vegetation which protects its surface from the Sun's rays; while the plains of the other are arid and naked; and for the most part act like furnaces in drawing the winds from the sea to supply air for the ascending columns which rise from its overheated plains.

Pushing these facts and arguments still further, these beautiful and interesting researches seem already sufficient almost to justify the assertion that were it not for the Great Desert of Zahara and other arid plains of Africa, the Western shores of that continent within the trade wind region would be almost, if not altogether, a rainless, sterile, and uninhabited district.

These investigations, with their beautiful developments eagerly captivate the mind; giving wings to the imagination, they teach us to regard the great deserts, the arid plains, and inland basins of the earth, as compensations in the great system of atmospherical circulation. Like counterpoises to the telescope, which the astronomer regards as incumbrances to his instrument, they are nevertheless necessary to give certainty and smoothness of motion;—facility, and accuracy to the workings of the machine.

The meteorological and physical researches with which the "Wind and Current Charts" are connected, relate only to the sea. Already the mariner has felt and acknowledged the importance of them. Commerce and navigation are reaping benefits from them of great moment; and American navigators, with that regard for the practical and useful which adorns their character and makes them renowned, have nobly stepped for-

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ward, and volunteered to co-operate with me in collecting facts for the further prosecution of the work. More than a thousand ships are now daily and hourly occupied in all parts of the ocean in making and recording, each a prescribed series of observations upon the winds and the currents, the rains, the calms, the storms, the thunder and the lightning;—the fogs, and clouds, and drift;—the temperature of the air and water; and all other subjects and objects, facts and phenomena, which are of interest to navigation and to science.

Each at the end of his voyage transmits to this office his "Abstract Log," as the series is called. Enough of these has already been collected to make two hundred large manuscript volumes, averaging each from two to three thousand days' observations, and the number is constantly increasing; indeed, the materials increase faster than I have force to discuss them.

When we travel out upon the ocean, and get beyond the influence of the land upon the winds, we find ourselves in a field particularly favorable for studying the general laws of atmospherical circulation.

Here, beyond the reach of the great equatorial and polar currents of the sea, there are no unduly heated surfaces, no mountain ranges, or other obstructions to the circulation of the atmosphere; nothing to disturb it in its natural courses. The sea, therefore, is the field for observing the operations of the general laws which govern its circulation. Observations on the land will enable us to discover the exceptions. But from the sea we shall get the general law. Each valley, every mountain range and local district, may be said to have its own peculiar system of calms, winds, rains, and droughts. But not so the surface of the broad ocean.

In this connection I beg leave to call the attention of meteorologists on shore to the importance of introducing a special column in their journals, to show what are the rainy winds at each station and for each season of the year.

Upon every water shed which is drained into the sea, the precipitation may be considered as greater than the evaporation for the whole extent of the shed so drained, by the amount of water which runs off into the sea. In this view, all rivers may be regarded as immense rain gauges; and the volume of water annually discharged by any one, as an expression of the quantity which is annually evaporated from the sea, carried back by the winds, and precipitated throughout the whole extent of the valley that is drained by it. Now, if we knew the rain winds from the dry for each locality and season generally throughout such a basin, we should be enabled to determine, with some degree of probability at least, as to the part of the ocean from which such rains were evaporated. And thus, notwithstanding all the eddies caused by mountain chains, and other uneven surfaces, we might detect the general course of the atmospherical circulation over the land as well as the sea, and make the general courses of circulation in each valley as obvious to the mind of the philosopher as is the current of the Mississippi, or of any other great river, to his senses. That river so abounds with eddies, that it is difficult to tell by regarding small portions of its surface only, which way the water is flowing. But when we come to regard the drift wood and the whole river, we are left in no doubt as to the onward course of the main stream itself, with all its eddies and whirlpools. They are all bound down to the sea together with the general mass of waters.

These investigations shew that the vapors which supply the sources of the Amazon with rain are taken up from the Atlantic Ocean by the N.E. and S.E. trade winds.



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They show that the trade-wind regions of the ocean, beyond the immediate vicinity of the land, are, for the most part, rainless regions; that the trade-wind zones may be described in a hyetographic sense as the evaporating regions.

They also show, or rather indicate as a general rule, that, leaving the polar limits of these two systems of winds, and approaching the nearest pole, the precipitation is greater than the evaporation, until the point of maximum cold is reached.

They also seem to indicate as a *general* rule, that the S. E. and N. E. trade winds which come from a lower to a higher temperature are the evaporating winds, i. e., they evaporate more than they precipitate, while those winds which go from a higher to a ~~warmer~~ lower temperature, are the rain winds, i. e., they precipitate more than they evaporate. That such is the case, these charts indicate; and reason tells us it is so.

The results of these charts therefore suggest the inquiry as to the sufficiency of the Atlantic after supplying the sources of the Amazon and its tributaries with their waters, to supply also the sources of the Mississippi and the St. Lawrence, and of all the rivers, great and small, of North America and Europe.

A careful study of the rain winds in connection with the "Wind and Current Charts" may indicate to us the "springs in the ocean" which supply the vapors for the rains that are carried off by those great rivers.

"All the rivers run into the sea: yet the sea is not full; unto the place from whence they come thither they return again."

Pardon this digression. It is my duty to give an account of what has been done at this office, and not in this place to speculate upon what might be done. It is better to report facts and give results than to speculate. But the field in which we are engaged is rich with promise. And it is due to the large corps of observers who are co-operating with me gratuitously and *con amore*, that I should state in a formal manner, not only what the fruits of those labors actually are, but what promise they give of future harvests, and thus encourage them to go on with their labors, with the assurance that the prospects before us justify the belief that important discoveries in the great laws which give circulation to the atmosphere and direction to the winds, and set to the currents, are beckoning us on.

Returning now to the trade winds of the Atlantic.—There is between the two systems, a region of calms, known as the equatorial calms. It has a mean average breadth of about six degrees of latitude. In this region the air which is brought along to the equator by the N.E. and S.E. trades ascends.

These calms cover a region of constant precipitation, and this region vibrates up and down the ocean as a zone or belt, as the trade winds vibrate. In the summer months it is found between the parallels of 8° and 14° of N. latitude, and in the spring between 5° S. and 4° N.

By this chart the navigator can tell what places within the range of this zone, have, during the year, two rainy seasons, what one, and what are the rainy months for each locality.

Were the N. E. and the S. E. trades with the belt of equatorial calms of different colors and visible to an astronomer in one of the Planets, he would by the motion of these belts or girdles alone, tell the seasons with us.

He would see them at one season going North, then appearing stationary, and then commencing their

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return to the South. But though he would observe that they follow the Sun in his annual course, he would discover that their extremes of declination are not so far asunder as the tropics, though in certain seasons the changes from day to day are very great. He would observe that these zones would linger near each of their tropics about three months, and that they would pass from one of their tropics to the other in a little less than another three months. Thus he would observe the whole system of belts to go North from the latter part of May till some time in August. Then they would stop and remain stationary till winter, in December; when again they would commence to slide down towards the South rapidly over the ocean until the last of February or first of March; when again they would become stationary and remain about this, their Southern tropic, till May again.

The zone of the S. E. trade winds would present its northern edge inclined somewhat to the equator: commencing near the coast of Africa and tracing the usual outlines of this edge over towards South America, he would discover that it approached the equator at an angle of about 15°; and he would announce that the equatorial edge of the zone of S. E. trades in the Atlantic lies W. 15° N. and E. 15° S.

Turning his attention now to the belt of N. E. trade winds, he would observe the equatorial edge of this zone to be somewhat, though not altogether, symmetrical with the equatorial edge of the S. E. trade wind zone of the other hemisphere. On the African side it is farthest from the equator, which it approaches at an angle of about 10° (W. by S.) until it reaches the meridian of about 40° West. Here it is deflected to the North and trends off in the direction of W. N. W. Here we begin to experience the effect of the North American continent upon the trade winds at sea. The rarefaction caused by the plains of northern Texas and the arid plains in that quarter, is sufficient in summer to convert the N. E. trades of the Gulf of Mexico into a prevailing wind from the Southward and Eastward.

In the Pacific and within a certain distance from the land, the N. E. trade winds are by the same influences converted into a S. W. monsoon.

By tracing on a chart the equatorial limits of the N. E. and S. E. trade winds, as herein described, it will be perceived that there is left between the two systems a wedge-shaped band having its broadest part on the African side of the Atlantic. The region of the ocean which the Planetary Astronomer would observe this band or belt to cover, is the region which is occupied by the equatorial calms and the African monsoons that fall between the systems of N. E. and S. E. trade winds. And were the belts which represent these calms different from the rest as to color, the imaginary astronomer would see it as somewhat of an irregular curve not having the northern and southern edges concentric. The concave side of this curved belt is turned to the E. of N. and has its centre near the shores of Greenland.

As before remarked, the newly discovered monsoons also come in with the equatorial calms and give the peculiar wedge-shaped form to the regions beween the two systems of trade winds.

Having completed the physical examination of the equatorial calms and winds, if the supposed observer from some distant sphere should now turn his telescope towards the poles, he would observe a zone of calms bordering the N. E. trade winds on the North, and another, the S. E. trade winds on the South. These also

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would be observed to vibrate up and down with the trade wind zones, partaking of their motions and following the declination of the Sun.

On the polar side of each of these two zones there would be a broad band extending up into the polar regions, the prevailing winds within which are the opposites of the trade winds, viz: S. W. in the Northern and N. W. in the Southern hemisphere.

The equatorial edge of these calm belts is near the tropics, and their average breadth is 10° or 12°. On one side of these belts the winds blow perpetually towards the equator; on the other, their prevailing direction is towards the poles.

They therefore may be considered as nodes in the general system of atmospherical circulation.

The atmosphere which the N. E. and S. E. trade winds keep in perpetual motion towards the equator has for its node the equatorial calms. Here it ascends, boils over, divides, and flows on in the upper regions of the atmosphere, one part going to the Northern, the other to the Southern hemisphere, to complete the round and supply the sources of the trade winds.

Arrived near the Tropic of Cancer, the northern current meets, in the upper regions of the atmosphere, the return current which the prevailing winds of the North temperate zone have carried as a surface current to the hyperborean regions of the North. These two currents produce another node or calm region, in which the atmosphere descends, and from which it issues both to the North and the South, assuming, on one side, the character of N. E. trades; on the other the character of the S. W. passage winds.

This node has its fellow in the Southern hemisphere; and from one side of the zone of the calms of Capricorn, the wind issues as the S. E. trades; from the other as the N. W. passage winds of the Southern hemisphere.

Along the polar borders of these two calm belts we have another region of precipitation, though generally the rains here are not so constant as they are in the equatorial calms. The precipitation near the tropical calms is nevertheless sufficient to mark the seasons; for whenever these calm zones, as they go from North to South with the Sun, leave a given parallel, the rainy season of that parallel is said to commence. Hence the rainy season in Chile at the South, and in California at the North.

This letter of the series of the charts will enable any one who consults it, to tell to what places the tropical calms bring rain, and in what months the rainy season commences and ends, for any parallel.

To complete the physical examination of the earth's atmosphere, which we have supposed an astronomer in one of the planets to have undertaken according to the facts developed by the wind and current charts, it remains for him to turn his telescope upon the icy regions of the poles. (For that *we* should complete the examination in this respect, it would be necessary to obtain the log book of ships in the anti-commercial regions of the ocean, which we cannot do. As the sea is most open near the South pole, the principles of the general law of atmospherical circulation would be better developed probably by observations in the Antarctic, than in the Arctic regions.)

For the want of such observations, but with the light which these charts throw on the subject for our

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guide, let us pursue the S. W. passage winds of the Northern hemisphere into the Arctic regions, and see theoretically how they get there; and being there, what becomes of them.

From the parallel of 40° up towards the pole the prevailing winds in the Northern hemisphere as already reported, are the S. W. passage winds, or as they are more generally called by mariners the "Westerly" winds; these prevail over the "Easterly" winds in the ratio of about two to one.

Now if we suppose, and such is probably the case, these "Westerly" winds to convey in two days a greater volume of atmosphere towards the Arctic circle than those "Easterly" winds can bring back in one, we establish the necessity for an upper current by which the difference may be returned to the tropical calms of our hemisphere. Therefore there must be some place in the polar regions at which these S. W. winds cease to go North, and from which they commence their return to the South, and this locality must be in a region peculiarly liable to calms. It is another atmospherical node in which the motion of the air is upward, with a decrease of barometric pressure.

If we now return to the calm belt of the northern tropics, and trace theoretically a portion of air that in its circuit shall fairly represent the average course of these S.W. passage winds, we shall see that it approaches the pole in a loxodromic curve; that as it approaches the pole it acquires from the spiral convolutions of this curve which represents its path, a whirling motion, in the direction of the hands of a clock moving *backwards*, and that the portion of atmosphere whose path we are following, would gradually contract its gyrations, until it would finally ascend, turning against the hands of a watch, as it went around.

Then reaching the upper regions of the atmosphere, its course would be to the southward; or rather, owing to the effect of the axial rotation of the earth, its course would be from the northward and eastward, until it should meet also in the upper regions a like portion from the ascending node formed in the calms near the equator. This place of meeting in the upper regions of the atmosphere, as already remarked, between these two portions of air moving in opposite directions, one from the equator and the other from the pole, takes place in the zone of the calms of Cancer. Here the two balance each other, produce a calm, or the descending node for the Northern hemisphere, with an increase of barometric pressure.

In the Southern hemisphere a like process is going on; only there the N.W. passage wind would, as it arrives near the Antarctic calms, acquire a motion with the Sun, or in the direction of the hands of a watch.

That such is the case, the investigations that are carried on here do not prove, but they, and a process of reasoning guided by analogy, derived from what they do show, suggest that such is *probably* the case.

The general course of the circulation of the atmosphere, as partly established and partly suggested by these researches and other sources of information is: an upper current from the pole, as far as the tropical calms, towards the equator; thence a descent and a surface current (N.E. trades) to the equatorial calms. Here an ascent takes place, through which air is supplied for an upper current each way towards the poles, as far as the zone of tropical calms. Here there is a descent; and a continuation towards the polar regions as a surface current, (S. W. passage winds) until it approaches, in part, the calms of the hyperborean regions. Here it commences to whirl about in the manner already stated, forming the supposed polar



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calms, in which it ascends, and so commences its return towards the South by reversing the circuit just stated.

"The wind goeth toward the South, and turneth about unto the North; it whirleth about continually, and the wind returneth again according to his circuits."

Letter C of the series shows the points of the compass from which the wind blows in all parts of the ocean, and for any month in the year. These are called the "Pilot Charts," of which the "North Atlantic," in two sheets, and "Coast of Brazil within the Trade Wind Region," in one sheet, have been published. The "South Atlantic" is in press; also the "Pacific Ocean," from the equator to 60° South, and from 70° to 120° West.

Sheets of this series are also in hand for the entire Pacific and Indian Oceans.

The officers employed upon them from time to time have been Lieutenants Herndon, Dulany, H. N. Harrison, Ball and Forrest; Passed Midshipmen Davenport, Powell, De Koven, Wainwright, Balch, Roberts, De Krafft, Woolley, Jackson, Murdaugh, and Semmes, and Professor Benedict.

The "Brazil Pilot" is on a scale to the square of 2° of latitude by 1° of longitude, and extends from the Equator to 23° South.

The rest of the series is on a scale of 5° to a square: that is, the ocean is divided off into districts of 5° of latitude by 5° of longitude. This chart, therefore, consists of a number of engraved squares without regard to figure of the earth, with four inscribed concentric circles in each; and in these circles are radii, drawn so as to represent every alternate point of the compass-card: thus; N.; N.N.E.; N.E.; E.N.E; East; and so on around the compass.

After all the log-books within reach have been examined, and the observations collated, the results are collected for each district, arranged according to months, and entered each set in its *wind-rose*, as the circumscribed square with its concentric circles and points of the compass is called. These entries are made in such a manner as to show at a glance the prevailing winds for any month in any part of the ocean. Not only so: the navigator sees at a glance how many days of observation have been discussed for each month in any district; and of these he sees the number of times calms have been found, and the number of times the winds have come from each of the sixteen points of the compass.

Thus in the wind-rose for the district between 5° and 10° N., 15° and 20° West, he would observe that in August 705 observations as to the course of the wind had been made here, and 13 as to the calms; *i. e.*, out of $\frac{718}{3}$ days passed by ships in this district during the month of August of various years, it was found to be calm thirteen times, of eight hours each; and the winds were observed to blow from E. 4 times*; E.S.E., 17.; S.E., 5; S.S.E., 165; S., 280; S.S.W., 171; S.W., 23; W.S.W., 26; W. 8.; W.N.W. 2; N.W., 1; N.N.W., 2; N.N.E., 1; and the other points 0.

The object has been to get at least one hundred observations for each month in every square of the ocean; this would require for the three great oceans 1,669,200 observations upon the direction of the winds alone.

* Taking "time" to mean a period of eight hours, or three "times" to make a day.

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In some of the wind-roses, or districts of 5° square, we have obtained more than a thousand observations for a single month; whereas, in neighboring districts and other months, we are left without a single observation—so limited and marked are the commercial paths over the ocean, according to the seasons.

Between the route to and fro around Cape Horn, and the routes to and from around the Cape of Good Hope, there is a part of the ocean of immense extent, that is seldom traversed by any vessel.

As the wind is found to blow in any part of any given district or division of 5° square, so it is assumed to blow in all other parts of that district.

The pilot charts therefore give us the number of times that the wind, in any part of the ocean, is found in a given number of times to come from each point of the compass; and consequently, the ratio between the number of times from any one point and all the others.

With such data it is practicable to calculate, according to the doctrine of chances, the track which will give the shortest average passage under canvass from port to port for any month.

This I have done for the route generally, between Europe and America; and from the ports of the United States, as far South as the parallel of Rio de Janeiro.

These routes have been calculated for each month and issued in a book of "Sailing Directions" to Navigators.

In the European voyages I have found not much room for improvement as to routes, except to those who are just entering that trade; to them these charts give all the information as to winds, currents, and routes that is possessed by the oldest and most experienced "Packet Captains."

When navigators generally come to follow these new routes, the average sailing passage between Europe and America will, it is believed, from what has already been done, be somewhat shortened.

But the new routes which these charts have suggested to the equator, and which lead through parts of the ocean in which the winds and currents were not so well understood as they are along the tracks to Europe, have been attended with more decided advantage, and with signal success.

The route of all vessels bound into the Southern hemisphere, whether their destination be the markets of South America, of the Pacific or Indian ocean, is the same as far as the equator: and these charts have actually shortened the average passage hence to the equator, from two days to two weeks according to the season of the year; this is shown by the results of actual trial. More than a hundred passages have been made by these charts, and according to the routes prescribed. The average length of passage by the old route from the ports of the United States to the line, is forty-one days. The average passage by the new routes has been so far, for January, 31 days; for February, 25; for March, 27½; April, 28½; May, 34; June, 33; July, 40; (by the old route in this month the passage is 48 days,) for August, 41; for September, 39; for October, 37; November, 32, and December, 34, against 38½ by the old route.

As I write, I receive the abstract logs of the U. S. S. "Saratoga," (Captain Walker,) and of the merchant barque "Dragon," (Captain Andrew.)

They sailed at the same time, both in the month of September last: the "Saratoga" took the old route;

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went as far as 19° of West longitude; and crossed the equator the forty-second day out. The "Dragon" took the new route; crossed the equator the thirty-fourth day; and had passed the parallel of Rio de Janeiro in 23° S., before the "Saratoga" had reached the line; thus making a gain of 1500 miles upon her competitor, with a saving that far of ten days on the passage.

Thus the importance of the undertaking to collect and embody the experience of every navigator as to the winds and currents of the sea, and so to represent it that each may have the benefits of the experience of all, is proved daily. Encouragement is therefore given for the vigorous prosecution of the work.

Upwards of 20,000 sheets of these charts have been distributed, and the demands for them are daily increasing.

Letter D of the series, are thermal charts; they show the temperature of the surface water of the ocean wherever and whenever it has been observed. These observations are characterized by colors and symbols in such a manner that by a mere inspection of the charts, the temperatures for any one month may be recognized and distinguished from the rest. The scale is Fahrenheit; and the temperatures are put down just as they are given in each log-book, without any attempt to correct for error of thermometer. The thermal chart of the North Atlantic, compiled by Lieutenant Gantt, in eight large sheets, is in press. That of the South Atlantic is in process of construction by Lieutenant Gardner, and is nearly ready for the press.

The isothermal lines for 80°, 70° and so on, for every 10° of ocean temperature, are drawn for each month upon these charts.

They afford much valuable and interesting information touching the circulation of the ocean waters, including the phenomena of cold and warm currents; they also cast light upon the subject of the hyetographic and climatic peculiarities of various regions of the earth; they increase to a marked extent our stock of knowledge concerning the Gulf Stream, that great phenomenon of the ocean; for they show that the warm waters of this stream as it pursues its course towards Europe, have a vibratory motion, so to speak, across their course, like a pendulum slowly propelled by heat on one side, and drawn back by cold on the other; It vibrates to and fro with the season, preserving in the mean time a peculiar system of convolutions that calls to mind the graceful wavings of a pennon as it floats gently to the breeze. Indeed, if we imagine the head of the Gulf Stream, hemmed in by the land in the Straits of Bemini, to be stationary there, and then liken the tail of the stream itself to an immense pennon floating gently in a current:—such a motion as such a streamer may be imagined to have, very much such a motion do these charts show the tail of the Gulf Stream to have.

These charts were prepared for the press in four sets,—one set for the temperatures for each season,—but they are to be published with the temperatures of all four seasons on the same sheet. I have therefore not had an opportunity to study them except in sets for one season at a time,—therefore I cannot give as complete an account of all the facts which they develope, as I shall be able to do when they appear with the observations for each month grouped and presented side by side with the observations for all the other months.

In 1844 I read before the National Institute, a paper "on the Gulf Stream and currents of the sea." Up to that time but little was known of this "river in the ocean," except that it exists and conveys an immense

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body of warm water from the Gulf of Mexico through the Straits of Florida into the Atlantic Ocean, thence along the coast of the United States towards the shores of Europe by the way of the Grand Banks. Beyond this* little or nothing was known with regard to it. But since the appearance of that paper, attention has been very much directed to the Gulf Stream.† The Coast Survey has been at work upon it, and the information collected by that establishment and the officers of the navy, with regard to it, added to that afforded by these charts, may be said to exceed in philosophical extent and value all that was previously known about it.

These investigators confirm to a remarkable extent the speculations put forth in that paper; they have converted many of the suggestions of theory into philosophical facts, and given increased importance to the views presented in 1844.

In that paper which was read before the National Institute in the month of April, and repeated, by request, before the Association of American Geologists and Naturalists the same year, it was remarked with regard to the Gulf Stream and its counter current, the ice-bearing current from the North:

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*"Upon a correct knowledge of the force and set of currents in the ocean, often depends not only the safety of vessel and cargo, but the lives of all on board; and, owing to the want of this knowledge, hundreds of vessels, thousands of persons, and millions of property are annually cast away or lost at sea.

"I do not intend to occupy the time of members with a recapitulation here of what we do know with regard to ocean currents; that indeed might soon be told; for we know little or nothing of them, except that they are to be met with here and there at sea, many of them sometimes going one way and sometimes another; and that the waters of some of them are colder and of others warmer than the seas in which they are found. That we should have a better knowledge of them, and of the laws which govern them is not only an important matter to those who follow the sea, or make ventures abroad, but it is also a matter of exceeding interest to all those whose enlarged philanthropy, or ennobling sentiments prompt in them a desire to diffuse knowledge among their fellows, or in any manner to benefit the human race. The mere fact that this meeting is held at all, is evidence ample and complete that it is composed altogether of such. I therefore submit it is a question for the consideration of this meeting, whether it be not competent for the National Institute to devise and set on foot a plan for multiplying observations and extending our information upon these interesting phenomena. A subject of vast importance in the business of commerce and navigation, the currents of the ocean seem to me to be altogether worthy the attention of this society—a series of well conducted observations upon them would be in perfect unison with the great objects of usefulness for which it was created and now exists, and for which its distinguished members and guests have been invited, and are here assembled from all parts of the country.

"Before such an assemblage of mind and intelligence, it is necessary only to mention the meagre state of our information even with regard to that great anomaly of the ocean, the Gulf Stream, and there will be—there can be, but one mind, as to the importance of making further observations, and of multiplying facts with regard to it. In simply reminding the society, that all we know of this wonderful phenomenon is contained chiefly in what Doctor Franklin said of it more than 50 years ago, that his facts were collected by chance as it were, and his observations made with but few of the facilities which navigators now have, I feel that enough and all has been done that is necessary to be done, in order to impress the Institute with the importance of further observations upon it." * * *

—*Paper on the Gulf Stream and currents of the sea. Read before the National Institute, April 2, 1844, by M. F. Maury, Lt. U. S. N.*

†"Linked thus with other geological agents, the currents of the sea cannot fail to present themselves to the mind of the geologist, as important and interesting subjects for investigation. How much more so are they in the eyes of the navigator; with him, the source of this coast current is a matter of conjecture, and its cause a mystery. And as to its strength, its fluctuations and the laws which govern them, his nautical books are all but silent. Nor has the history of navigation recorded the first series of systematic observations upon it.

"Proceeding further into the Atlantic, we find a vast stream of warm water running counter to this. It is the Gulf Stream bound from the Straits of Florida to the Banks of Newfoundland, and thence to the shores of Europe. What its breadth or its depth may be, we know not. We are told indeed that even at the same place it runs sometimes at the rate of two knots the hour, sometimes at five, and we know that it may always be found within certain broad limits, varying in this too at the same place, from 140 to 340 miles. With this our knowledge of it ends; though more accurate information as to it and its offsets would many a time have saved the mariner from disaster and shipwreck, and even now, would add not a little to the speedy and safe navigation of the Atlantic.

"Though navigators had been in the habit of crossing and recrossing the stream, almost daily, for the space of near 300 years, its existence even was not generally known among them, until after Dr. Franklin discovered the warmth of its waters, about 70 years ago. And to this day, the information which he gave us, constitutes the basis, I had almost said the sum and substance of all we know about it."—*Ibid.*



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"The Gulf Stream, as it issues from the Straits of Florida, is of a dark indigo blue; the line of junction between it and the '*roily*' green waters of the Atlantic, is plainly seen for hundreds of miles. Though this line is finally lost to the eye as the stream goes North, it is preserved to the thermometer for several thousand miles; yet to this day the limits of the Gulf Stream, even in the most frequented parts of the ocean, though so plainly marked, are but vaguely described on our charts. Thousands of vessels cross it every year; many of them make their observations upon it; and many more, if invited, would do the same. But no one has invited co-operation;* consequently there is no system, and each one that observes, observes only for himself; and when he quits the sea, his observations go with him, and are to the world as though they had not been. * *

"Supposing the pressure of the waters that are *forced* into the Carribbean Sea by the trade winds to be the *sole* cause of the Gulf Stream, that sea and the Mexican Gulf should have a much higher level than the Atlantic. Accordingly, the advocates of this theory † require for its support 'a great degree of elevation.' Major Rennell likens the stream to 'an immense river descending from a higher level into a plain.' Now, we know very nearly the average breadth and velocity of the Gulf Stream in the Florida Pass. We also know, with a like degree of approximation, the velocity and breadth of the same waters off Cape Hatteras. Their breadth here is about 75 miles against 32 in the 'Narrows' of the Straits, and their mean velocity is three knots off Hatteras against four in the 'Narrows.' This being the case, it is easy to show that the depth of the Gulf Stream off Hatteras is not so great as it is in the 'Narrows' of Bemini by nearly fifty per cent., and that, consequently, instead of *descending*, its bed represents the surface of an inclined plane from the North, *up* which the lower depths of the stream *must* ascend. If we assume its depth off Bemini to be two hundred fathoms, which are thought to be within limits, the above rates of breadth and velocity will give one hundred and fourteen fathoms for its depth off Hatteras. The waters, therefore, which in the Straits, are below the level of the Hatteras depth, so far from descending, are actually *forced up* an inclined plane, whose submarine ascent is not less than ten inches to the mile!

"The Niagara is an 'immense river descending into a plain.' But instead of preserving its character in Lake Ontario as a distinct and well defined stream for several hundred miles, it spreads itself out, and its waters are immediately lost in those of the Lake. Why should not the Gulf Stream do the same? It gradually enlarges itself it is true; but instead of mingling with the ocean by broadspreading as the 'immense rivers' descending into the Northern lakes do, its waters, like a stream of oil in the ocean, preserve their distinctive character for more than 3,000 miles.

"Moreover, while the Gulf Stream is running to the North from its supposed elevated level at the South, there is a cold current coming down from the North; meeting the warm waters of the Gulf midway the ocean, it divides itself and runs *by the side of them* right back into those very reservoirs at the South, to which theory gives an elevation sufficient to send out entirely across the Atlantic a jet of warm water said to be more than three thousand times greater in volume than the Mississippi river. This current from Baffin's Bay has not

* The wind and current charts have called forth the co-operation here proposed.

† That the Gulf Stream is caused by the trade winds.

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only no trade winds to give it a head; but the prevailing winds are unfavorable to it, and for a great part of the way it is below the surface, and far beyond the propelling reach of any wind. And there is every reason to believe that this polar current is quite equal in volume to the Gulf Stream. Are they not the effects of like causes? If so, what have the trade winds to do with the one more than the other?

"Nay more. At the very season of the year when the Gulf Stream is rushing in greatest volume through the Straits of Florida and hastening to the North with the greatest rapidity, there is a cold stream from Baffin's Bay, Labrador, and the coasts of the North, running to the South with equal velocity. Where is the trade wind that gives the high level to Baffin's Bay, or that even presses upon or assists to put this current in motion? The agency of winds in producing currents in the deep sea must be very partial.

"These two currents meet off the Grand Banks, where the latter is divided. One part of it underruns the Gulf Stream, as is shown by the icebergs which are carried in a direction tending across its course. The probability is, that this 'fork' *continues on towards the South*, and runs into the Carribbean Sea, for the temperature of the water at a little depth there, has been found far below the mean temperature of the earth, and quite as cold as at a corresponding depth off the Arctic shores of Spitzbergen. * * * *

"More water can not run from the equator, or the pole, than to it. If we make the trade winds cause the former, some other wind must produce the latter; but these, for the most part, and for great distances, are *submarine* and therefore beyond the influence of winds. Hence, it should appear that *winds* have little to do with the general system of aqueous circulation in the ocean.

"The other 'fork' runs between us and the Gulf Stream to the South as already described. As far as it has been traced, it warrants the belief that it too runs *up* to seek the so called *higher* level of the Mexican Gulf. * * * * * * *

"Therefore this immense volume of water, in passing from the Bahamas to the Grand Banks, meets with an opposing force in the shape of resistance, sufficient in the aggregate to retard it two miles and a half the minute, and this only in its Eastwardly rate. There is, doubtless, another force quite as great, retarding it towards the North, for its course shows that it is the resultant of two forces acting in different directions. If the former resistance be calculated according to received laws, it will be found equal to several atmospheres. And by analogy, how inadequate must the pressure of the gentle trade winds be to such resistance, and to the effect assigned them? If, therefore, in the proposed inquiry we search for a propelling power no where but in the higher level of the Gulf, we must admit, in the head of water there, the existence of a force capable of putting in motion and of driving over a plain, at the rate of 5 miles the hour, all the waters as fast as they can be brought down by 3,000 such streams as the Mississippi river—a power at least sufficient to overcome the resistance required to reduce from two miles and a half to a few feet per minute, the velocity of a stream that keeps in perpetual motion one-fourth of all the waters in the Atlantic Ocean. * * *

"But, in addition to this, may there not be a peculiar system of laws not yet revealed, by which the motion of fluids in such large bodies is governed when moving through each other in currents of different temperature. That currents of sea water, having different temperatures, do not readily commingle, is shown by

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the fact already mentioned: that the line of separation between the warm waters of the Gulf and the cold waters of the Atlantic is perfectly distinct to the eye for several hundred miles; and even at the distance of a thousand miles, though the two waters have been in contact and continued agitation for many days, the thermometer shows that the *cold water on either side still performs the part of river banks* in keeping the warm waters of the stream in their proper channel.

"In a winter's day off Hatteras, there is a difference between these waters of near 20°. Those of the Gulf being warmer, we are taught to believe that they are lighter; they should therefore occupy a higher level than those through which they float. Assuming the depth here to be 114 fathoms, and allowing the usual rates of expansion, figures show that the middle of the Gulf Stream here should be nearly 2 feet higher than the contiguous waters of the Atlantic. Were this the case, the surface of the stream would present a double inclined plane, from which the water would be running down on either side, as from the roof of a house. As this ran off at the top, the same weight of colder water would run in at the bottom; and thus, before this mighty stream had completed half its course, its depths would be brought up to the surface, and its waters would be spread out over the ocean. Why then does not such a body of warm water, flowing and adhering together through a cold sea, obey this law, and occupy a higher level? If it did, the upper edges of its *cold banks* would support a lateral pressure of at least 100 lbs. to the square foot; and vessels, in crossing it, would sail over a ridge as it were; on the East side of which, they would meet an Easterly current; and on the West side, a Westerly current. * * * * * *

"The maximum temperature of the Gulf Stream is 86°, or about 9° above the ocean temperature due the latitude. Increasing its latitude 10°, it loses but 2° of temperature. And, after having run 3,000 miles towards the North, it still preserves, even in winter, the heat of summer. With this temperature, it crosses the 40th degree of North latitude, and there, overflowing its *liquid banks*, it spreads itself out for thousands of square leagues over the cold waters around, and covers the ocean with a mantle of warmth that serves so much to mitigate in Europe the rigors of winter. Moving now more slowly, but dispensing its genial influences more freely, it finally meets the British Islands. By these it is divided, one part going into the polar basin of Spitzbergen, the other entering the Bay of Biscay, but each with a warmth considerably above ocean temperature. Such an immense volume of heated water can not fail to carry with it beyond the seas a mild and moist atmosphere. And this it is which so much softens climate there. * * *

"May there not exist between the waters of the stream and their *fluid banks*, always heaving and moving to the swell of the sea, a sort of *peristaltic* force, which, with other agents, assists to keep up and preserve this wonderful system of ocean circulation? * * * *

"The line of meeting between the waters of the Gulf Stream and the Atlantic is distinct to the naked eye for several hundred miles. This unreadiness of cold and tepid sea-water to commingle has been often remarked upon, and seems to impart to one current the power of dividing and turning others aside. Thus the Gulf Stream bifurcates the Labrador current, one part of which underruns the Gulf Stream, and the other takes a southwestwardly direction along the coast. * * * *

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"*It would be curious to ascertain the routes of these under-currents on their way to the tropical regions*, which they are intended to cool. One has been found at the equator 200 miles broad and 23° colder than the surface water. Unless the land or shoals intervene, it no doubt comes down in a spiral curve. * *

"What time more fit,—what occasion more suitable than the present for maturing a plan of operations, and for setting on foot a system of observations upon the Gulf Stream and its kindred phenomena of the sea?"*

Thus, by a process of reasoning and argument it was shown that the Gulf Stream as far as the Banks of Newfoundland flows through a bed of cold water, which cold water performs to the warm, the office of banks to a river;† and which "cold banks" thus pointed out, were discovered with the deep-sea thermometer by Lt. George M. Bache, U. S. N., in 1846, while operating in connection with the Coast Survey. They partake so decidedly of the character of banks to a river, that in the annual report of the Coast Survey for 1846, and elsewhere, these banks were likened to a "cold wall," and by Lt. Bache in his report to the superintendent of the survey, to a "bank of cold water against which the Gulf Stream butts up."‡

It was also theoretically shown that the Gulf Stream actually flows up hill: §

That its bottom is a bed of cold water: ‖

That it bifurcates a cold stream from the North, near the Banks of Newfoundland, and that one fork of this stream pursues thence on the other side of the Gulf Stream a *southwestwardly* course as a current of cold water, for the most part submarine: ¶

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* From this question may be traced the origin of the undertaking, which has resulted in the "wind and current charts." The association appreciating the importance of the subject and the suggestions connected with it, readily came forward and used their influence in behalf of the undertaking. It was remarked to them then:

"Gentlemen here, and good men everywhere, can do much to aid in this plan by giving it their countenance, and using their influence with masters by inducing them to send to Washington an abstract of their logs, though it contain only the track of the vessel, with the winds and temperatures. Even this would be valuable, and any thing additional would be much more so. Our whalemen do collect and have it in their power to give much truly valuable information. That which they collect concerns the meteorologist, the naturalist and others, not less than the navigator and geologist. Indeed, the ocean, with its almost unsealed book of mysteries, presents to the votary of science, whatever be the name of his association, a common highway, upon which each society, like every nation, may make its ventures and return in vessels laden with treasures to enrich the mind and benefit the human race."—*Extract from a "Paper on the Currents of the Sea as connected with Geology, read before the association of American Geologists and Naturalists, May* 14, 1844—*by M. F. Maury, Lt. U. S. N.*"

† "The cold water on either side, still at the distance of a thousand miles, performs the part of *river banks* in keeping the warm water of the (Gulf) Stream in the proper channel."—*Paper on the Gulf Stream and Currents of the Sea.*

‡ "Here on the left we have the main currents of the (Gulf) Stream turned to the Eastward by Cape Hatteras, and *butting up against a bank of cold water*, which it overflows."—*Report of Coast Survey*, 1846, *Appendix*, *No.* 4, *page* 50.

§ "It is easy to show that the depth of the Gulf Stream off Hatteras is not so great as it is in the "narrows" of Bemini by nearly 50 per cent, and that consequently, instead of *descending*, its bed represents the surface of an inclined plane from the North, up which the lower depths of the stream *must* ascend. If we assume its depth off Bemini to be 200 fathoms which are thought to be within limits, the above rates of breadth and velocity will give 114 fathoms, for its depth off Hatteras. The waters, therefore, which in the straits are below the level of the Hatteras depth, so far from descending, are actually forced up an inclined plane, whose submarine ascent is not less than 10 inches to the mile."—*Paper on the Gulf Stream and Currents of the sea, read before the National Institute by M. F. Maury, Lt. U.S.N., April* 2, 1844.

‖ "As this," (the warm water of the Gulf Stream made specifically lighter by its temperature,) "ran off at the top, *the same weight of colder water* would run in at the *bottom*."—*Ibid.*

"The Gulf Stream bifurcates the Labrador current; one part of which *underruns* the Gulf Stream."—*Paper on the currents of the sea as connected with geology, read before the Association of American Geologists and Naturalists, May* 14*th*, 1844, *by M. F. Maury, Lieut. U. S. N.*

¶ "Apparently, in obedience to the laws here hinted at, there is a constant tendency of polar waters towards the tropics and of tropical waters towards the poles."—*Lt. Maury on the Gulf Stream.*

"It would be curious to ascertain the routes of these under currents on their way to the tropical regions, which they are intended to



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That it is bifurcated by the British Isles: *

And that its surface is a double inclined plane, having the ridge or line of meeting of these two planes near the axis of the stream—from which the surface water, like the rain from the roof of a house, runs off towards each side.†

Most, if not all the conditions which the study of the subject induced me in 1844 to announce as theoretically to exist, have since, as already remarked, been converted into physical facts, by the operations of the Coast Survey, or by the navigators who have been observing in connection with the wind and current charts.

The observations made in 1846 by Lieut. George M. Bache, U. S. N., for the Coast Survey,‡ and continued in 1847,§ and 1848,‖ by Lieutenants S. P. Lee and Richard Bache upon the deep sea and surface temperatures in and about the Gulf Stream, and confirmed as to the surface temperatures by these charts, as well as by the observations of Lieut. J. C. Walsh, U. S. N., while observing in connection with them in 1850,—this mass of careful observations thus collected,—all goes to confirm the theoretical suggestions of 1844 with regard to the *cold banks* and currents of cold water over or through which the Gulf Stream finds its way to the Northward.

The officers of the Coast Survey already alluded to, discovered the banks of the Gulf Stream off the coasts of North Carolina and Virginia to be a "wall of cold water," and also that the water at great depths was at a very low temperature—38° of Fahrenheit.

They also found on the surface of the ocean, East of the Gulf Stream, layers or streaks of warm water; it was inferred that this warm water comes from the Gulf Stream,—that it sent off a branch in the direction of the Island of Bermuda. It was concluded, therefore, that here was a bifurcation of this stream.

In 1850, Lieut. Walsh, who was sent out in the U. S. Schooner "Taney," to make certain observations which Congress had authorised the Secretary of the Navy to have made, in connection with my researches¶ concerning the winds and currents of the sea, found like layers or streaks of warm and cold water, and came to a like conclusion, as to this bifurcation or "off set" of the Gulf Stream.

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cool. One has been found at the equator 200 miles broad and 23° colder than the surface water. Unless the land or shoals intervene, it no doubt comes down in a spiral curve; meeting the warm waters of the Gulf midway the ocean, it (the cold current) divides itself and runs by the side of them right back into those very reservoirs at the South."—*Ibid.*

* "It finally meets the British Islands. By these it is divided—one part going into the polar basin of Spitzbergen; the other entering the Bay of Biscay."—*Ibid.*

† "In a winter's day off Hatteras, there is a difference between these waters of near 20°. Those of the Gulf being warmer, we are taught to believe that they are lighter; they should therefore occupy a higher level than those through which they float. Assuming the depth here to be 114 fathoms, and allowing the usual rates of expansion, figures show that the middle of the Gulf Stream here should be nearly 2 feet higher than the contiguous waters of the Atlantic. Were this the case, the surface of the stream would present a double inclined plane, from which the water would be running down on either side, as from the roof of a house. As this ran off at the top, the same weight of colder water would run in at the bottom; and thus, before this mighty stream had completed half its course, its depths would he brought up to the surface, and its waters would be spread out over the ocean. Why then does not such a body of warm water, flowing and adhering together through a cold sea, obey this law, and occupy a higher level."

‡ *Vide* "Annual Report of the Coast Survey for 1846."

§ *Vide* "Annual Report of the Coast Survey for 1847."

‖ *Vide* "Annual Report of the Coast Survey for 1848."

¶ See paper marked D.

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In a letter* giving me an account of his cruise, which was unfortunately interrupted by his vessel proving to be unseaworthy, he says; "we discovered the *hot waters of the Gulf Stream* extending as far East as 72° 10′, in a latitude so far South as 33° 30′. The column of water temperature in the Abstract,† from May 23 to 29, while engaged in the search for Ashton Rock, will satisfy you of this interesting and important fact, for you will notice that whenever we reached that longitude in our various tracks between the latitudes of 33° 30′ and 34° North, we experienced a sudden change of as much as 5° and 6° in the surface temperature,—70° to 76° :—this must be a branch or off set from the Gulf Stream."

Now these charts do not show that the temperature of the ocean between these parallels beyond the Gulf Stream is any higher than it is between the same parallels generally, until you approach the coast of Africa. The isotherm of 70° for each month, generally, after leaving the Gulf Stream stretch off to the Eastward, going up as high in some months as the parallel of 45°. Recrossing the parallel of 40° North between the meridians of 15° and 20° W., they then make a sharp turn to the Southward and Eastward, showing all the surface water between that and the Equator, to be permanently 70° and upwards. It is not probable, therefore, that the Gulf Stream can supply such an extent of Ocean with its warm waters; nor is it clear, that the warm water of the cool and warm streaks, reported as above, came from the Gulf Stream. The cool water was probably the intruder from below; indeed these charts have revealed a natural process of heating and cooling the surface of the Ocean, which I am not certain has been discovered before. It is exceedingly beautiful, and goes far to explain this phenomenon of the streaks: when the rays of the Sun are operating with their greatest intensity in the Northern hemisphere, they then raise the temperature of the equatorial surface of the ocean to the highest pitch. Its waters thus becoming lighter, flow to the North in a gentle surface current of warm water.

Thus the isotherm of 80°, for example, will pass from its extreme Southern to its extreme Northern declination in about three months.

Being now left to the gradual process of cooling by evaporation and radiation, it occupies the other eight or nine months of the year, in gradually returning South to the parallel whence it commenced to flow North. How natural that in flowing North, it should go in layers; and in cooling, that some parts should cool faster than the others; also that the cool water from below, should now and then be forced up through the mantle of warm water with which the heat has covered certain parts of the Ocean. When we come down to the lower temperatures—the isotherm of 60°—for example, the reverse takes place. In this case the most rapid motion of this isotherm is due to a movement of the waters from the hyperborean regions.

Between the meridians of 25° and 30° West, the isotherm of 60° in September, ascends as high as the parallel of 56° N. In October, it reaches the parallel of 50° North. In November, it is found between the parallels of 45° and 47°, and by December, it has nearly reached its extreme Southern descent between these meridians, which it accomplishes in January, standing then, near the parallel of 40°. It is all the rest of the year in returning Northward to the parallel whence it commenced its flow in September.

* See paper marked C.

† See paper marked B.

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Now it will be observed, that this is the season—from September to December—immediately succeeding that in which the heat of the Sun has been playing with greatest activity upon the polar ice. Its melted waters which are thus put in motion in June, July and August, would probably occupy the fall months in reaching the parallels indicated.

These waters though cold and rising gradually in temperature as they flow South, are probably fresher; and if so, probably lighter than the sea water; and therefore, it may be that both the warmer and cooler systems of these isothermal lines are made to vibrate up and down the Ocean, by a gentle surface current in the season of quick motion; and in the seasons of the slow motion, by a gradual process of caloriffc absorption in the one case, and by a gradual process of cooling in the other.

We have the same phenomenon exhibited by the waters of the Chesapeake Bay, during the winter.

At this season of the year, the charts show that water of very low temperature is found projecting out and over-lapping the usual limits of the Gulf Stream. The outer edge of this cold water, though jagged, is circular in its shape, having its centre near the mouth of the Bay. The waters of the Bay being fresher than those of the sea, may therefore, though colder, be lighter than the warmer waters of the ocean. And thus we have repeated here, though on a smaller scale, the phenomenon as to the flow of the cold waters from the North, which forces the surface isotherm of 60° from latitude 56° to 40°, during three or four months.

We have in the making of ice, and in the melting of it again, examples of this irregularity of outline on a still smaller scale. In the freezing of an ordinary pond, the fascicles of ice shoot out, and represent with their spires the jagged edges, or the cold and warm streaks alluded to. They perfectly illustrate in freezing the manner in which a gentle current of warm water overflowing a surface of cold water, may be supposed to send out its couriers or advance streams ahead; and, in melting, the reverse, or the case of the cold water intruding upon the warmer.

From these facts, and in the view which I am induced to take of them, I am led to infer that the mean temperature of the atmosphere between the parallels of 56° and 40° North, and over that part of the ocean in which we have been considering the fluctuations of the isothermal line of 60°, is at least 60° of Fahrenheit,—and upwards, from January to August, and that the heat which the waters of the ocean derive from this source, atmospherical contact, and radiation,—is one of the causes which move the isotherm of 60° from its January to its September parallel.

It is well to consider another of the causes which are at work upon the currents in this part of the ocean, and which tend to give the rapid southwardly motion to the isotherm of 60°.

We know the mean dew point must always be below the mean temperature of any given place, and that consequently as a general rule at sea, the mean dew point, due the isotherm of 60°, is higher than the mean dew point along the isotherm of 50°, and this again higher than that of 40°—this than 30°, and so on.

Suppose merely for the sake of illustration, that the mean dew point for each isotherm, be 5° lower than the mean temperature, we should then have the atmosphere which crosses the isotherm of 60°, with a mean dew point of 55°, gradually precipitating its vapors until it reaches the isotherm of 50°, with a mean dew

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point of 45°. By which difference of dew point, the total amount of precipitation over the entire zone, between the isotherms of 60° and 50°, has exceeded the total amount of evaporation from the same surface.

Now as a general rule in the Atlantic ocean, and it may be inferred in the Pacific also, the prevailing direction of the winds, to the North of the 40th parallel of North latitude, is from the Southward and Westward, in other words, it is from the higher to the lower isotherms; passing, therefore, from a higher to a lower temperature over the ocean, the total amount of vapor deposited by any given volume of atmosphere, as it is blown from the vicinity of the tropical, towards that of the polar regions, is greater than that which is taken up again. How the land may modify this position is another question. I speak of the rule at sea, not of the exceptions on the land.

Now then these investigations have brought out prominently before us the fact, that there is near the tropics, both of Cancer and Capricorn, a belt of calms across the great oceans. That on the Equatorial side of these belts, the winds at the surface of the sea blow permanently towards the Equator,—i. e., they come from a cooler and go to a warmer region, thus increasing their capacity for moisture, and consequently taking up more vapor in this part of their circuit, than they precipitate down upon it again.

On the polar side of these calm belts of the tropics, the prevailing direction of the wind on the surface of the ocean, is towards the poles—i. e., from a warm to a colder temperature; and therefore in this part of their circuit, these winds must deposite more vapor than they can take up again.

These facts, though they be not new, yet they are pressed by the charts so forcibly upon us, that we are led irresistibly to the theoretical conclusion, that the trade wind regions of the ocean are the evaporating regions, and that as a general rule in all other regions of the world, except the deserts, and a few others, mostly on the land, the evaporation is less than the precipitation, and that the excess is returned by the rivers and the rains in the shape of currents from towards the poles to the evaporating regions of the Torrid Zone, and that the total amount of rain and river water discharged into the sea, without the limits of the evaporating region, expresses the volume by which the cold currents exceed the warm currents of the sea—designating as cold currents, all those which run into the Torrid Zone, and those as warm which bring their waters from it.

These charts indicate that upon the ocean, the area comprehended between the isotherms of 40° and 50° Farenheit, is less than the area comprehended between isotherms 50° and 60°; and this again less than the area between this last and 70°;—for the same reason that the area between the parallels of latitude 50° and 60° is less than the area between the parallels of latitude 40° and 50°; and they indicate that *theoretically* more rain to the square inch ought to fall upon the ocean between the colder isotherms of 10° difference, than between the warmer isotherms of the same difference.

Thus, to make myself clear: the aqueous isotherm of 50° in its extreme Northern reach, touches the parallel of 60° N. Now between this and the Equator there are but three isotherms: 60°, 70° and 80°, with the common difference of 10°. But between the isotherm of 50° and the pole, there are at least five others, viz: 40°, 30°, 20°, 10° and 0°, with a common difference of 10°. Thus to the North of the isotherm 50°, the vapor which would saturate the atmosphere from zero, and perhaps far below, to near 50° is deposited; while



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to the South of 50° the vapor which would saturate it from the temperatures of 50° up to that of 80°, can only be deposited. At least such would be the case if there were no irregularities of heated plains, mountain ranges, land, &c., to disturb the ocean laws of atmospherical circulation.

Having therefore theoretically at sea, more rain in high latitudes, we should have more clouds: and therefore it would require a longer time for the Sun with his feeble rays, to raise the temperature of the cold water, which from September to January, has brought the isotherm of 60° from latitude 56° to 40°, than it did for these cool surface currents to float it down.

After this Southward motion of the isotherm of 60° has been checked in December by the cold, and after the sources of the current which brought it down have been bound in fetters of ice, it pauses in the long nights of the Northern winter, and scarcely commences its return till the Sun re-crosses the Equator, and increases its power, as well in intensity as in duration.

Thus we have here, for the first time beautifully developed, the effects of night and day, of clouds and sunshine upon the currents of the sea. These effects are modified by the operations of more powerful agents, which reside upon the land; nevertheless feeble though those of the former class be, a close study of the thermal charts will indicate that they surely exist.

Now returning towards the South:—we may on the other hand infer that the mean atmospherical temperature for the parallels between which the isotherm of 80° fluctuates, is below 80° for the nine months of its slow motion. This vibratory motion suggests the idea that there is probably somewhere between the isotherm of 80° in August, and the isotherm of 60° in January, a line or belt of invariable or nearly of invariable temperature, which extends on the surface of the ocean, from one side of the Atlantic to the other. This line, or band, may have its cycles also, but they are probably of long periods.

Theoretically, such a line ought to be found for any given year, but its place for one entire year, may not coincide with its place for another, though the motion of such a belt from year to year, would probably be very small.

The observations upon which these charts are founded, run through a period of half a century; consequently they show the temperature for the months only, without regard to the year, and therefore they do not enable us to decide satisfactorily as to the existence of such a belt of uniform or nearly uniform ocean temperatures for any one year.

Taking the isotherms of 50° and 60°, to illustrate the manner generally in which the waters of different temperatures run into each other, we shall find that their line of separation is not smooth, but jagged. The line of junction below the warm and cold waters of the sea is not unlike the sutures of the skull bone on a grand scale. The waters of one temperature are dove-tailed and fitted into those of another, in apparently the most irregular manner; but nevertheless like the sutures of the skull when they come to be examined closely, these lines of articulation clearly indicate traces of symmetry.

Now a vessel,—when waters of marked differences of temperature meet,—that sails along their line of junction, will come across layers or streaks of water, at one time warmer, at another cooler. Where a

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jagged point of warmer water is found in one month to thrust itself up into a body of cooler water, perhaps the next month it will be found that this obtruding of the warm water has disappeared and given place to the intrusion from the cooler water, of an articulating surface equally irregular in its outlines. Such layers of cooler and warmer streaks of water are generally to be found along that part of the usual sailing route between New York and the north of Europe, which runs with the Gulf Stream.

A better idea as to these irregularities in the temperature of the ocean, cannot be conveyed than by quoting from the logs of a few of the many vessels in that trade, which are co-operating with me in collecting materials for the "Wind and Current Charts," and from which it will be seen that it is by no means an extraordinary occurrence for the water thermometer in the course of one good day's sail, to pass through a range—up and down—of 50°.

## EXTRACT FROM ABSTRACT LOGS.

| 1850. | Latitude. | Longitude. | Temperature of water. | Change of Temperature. | |
|---|---|---|---|---|---|
| | ° ′ | ° ′ | ° | ° | |
| May 6 | 39.43 N. | 64.0 W. | 66 | + 20 | |
| 7 | 41.5 | 62.10 | 42 | — 24 | |
| 8 | 42.20 | 60.0 | 41 | — 1 | |
| 9 | 40.27 | 59.15 | 66 | + 25 | |
| 10 | 41.55 | 56.10 | 48 | — 18 | Ship "Prince Albert," Capt. Meyer,— New York to London. 1850. |
| 11 | 41.34 | 52.0 | 60 | + 12 | |
| 12 | 41.5 | 50.10 | 60 | 0 | |
| 13 | 42.20 | 46.0 | 51 | — 9 | |
| 14 | 44.10 | 42.20 | 68 | + 17 | |
| 15 | 45.20 | 40.30 | 62 | — 6 | |
| | ° ′ | ° ′ | ° | ° | |
| May 9 | 40.36 N. | 67.23 W. | 46 | — 1 | |
| 10 | 41.10 | 63.30 | 62 | + 16 | |
| 11 | 41.0 | 59.32 | 54 | — 8 | |
| 12 | 41.33 | 55.44 | 45 | — 9 | Ship "Ticonderoga," Captain Farran,— New York to Liverpool. 1850. |
| 13 | 41.26 | 52.8 | 60 | + 15 | |
| 14 | 40.52 | 49.0 | 64 | + 4 | |
| 15 | 41.50 | 47.33 | 51 | — 13 | |
| 16 | 42.19 | 47.5 | 44 | + 3 | |
| 17 | 43.19 | 44.34 | 64 | + 10 | |
| | ° ′ | ° ′ | ° | ° | |
| May 27 | 38.41 N. | 70.41 W. | 54 | + 3 | |
| 28 | 38.56 | 64.17 | 78 | + 24 | |
| 29 | 41.20 | 59.10 | 52 | — 26 | |
| 30 | 41.31 | 55.23 | 57 | + 5 | Ship "Queen of the West," Capt. Hallet, New York to Liverpool. 1850. |
| 31 | 44.16 | 48.34 | 40 | — 17 | |
| June 1 | 44.16 | 43.15 | 57 | + 17 | |
| 2 | 45.28 | 30.58 | 61 | — 4 | |
| 3 | 46.29 | 35.53 | 55 | — 6 | |

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EXTRACT FROM ABSTRACT LOGS—*Continued.*

| 1850. | Latitude. | Longitude. | Temperature of water. | Change of Temperature. | |
|---|---|---|---|---|---|
| | ° ′ | ° ′ | ° | ° | |
| May 30 | 40.30 N. | 66.5 | 60 | 0 | |
| 31 | 41.45 | 65.0 | 42 | — 18 | |
| June 1 | 41.1 | 63.37 | 60 | + 13 | |
| 2 | 40.16 | 61.41 | 48 | — 12 | |
| 3 | 41.14 | 57.37 | 62 | + 14 | Ship "Princeton," Captain Russell,—New York to Liverpool. 1850. |
| 4 | 41.49 | 56.49 | 64 | + 2 | |
| 7 | 42.21 | 50.18 | 44 | — 20 | |
| 9 | 44.18 | 42.29 | 60 | + 16 | |
| 10 | 44.38 | 38.42 | 52 | — 8 | |
| 11 | 46.10 | 33.57 | 58 | + 6 | |
| | ° ′ | ° ′ | ° | ° | |
| June 13 | 41.35 N. | 52.55 W. | 66 | + 4 | Ship "Ivanhoe," Captain King,—New |
| 14 | 42.8 | 48.21 | 49 | — 17 | York to Liverpool. 1850. |
| 15 | 43.0 | 44.39 | 66 | + 17 | |
| | ° ′ | ° ′ | ° | ° | |
| June 10 | 41.55 N. | 51.40 W. | 63 | + 13 | Ship "New York," Captain Marshall,— |
| 11 | 41.47 | 48.20 | 54 | — 9 | New York to Liverpool. 1850. |
| | ° ′ | ° ′ | ° | ° | |
| June 30 | 40.29 N. | 61.14 W. | 62 | + 2 | |
| July 1 | 41.29 | 59.41 | 74 | + 12 | Ship "Roscius," Captain Eldridge,— |
| 2 | 41.30 | 53.20 | 70 | — 4 | New York to Liverpool. 1850. |
| 3 | 41.37 | 48.38 | 58 | — 12 | |
| 4 | 41.27 | 46.14 | 68 | + 10 | |
| | ° ′ | ° ′ | ° | ° | |
| June 17 | 42.49 N. | 51.50 W. | 53 | + 3 | Ship "West Point," Captain Allen,—New |
| 18 | 43.35 | 49.20 | 47 | — 6 | York to Liverpool. 1850. |
| 19 | 45.4 | 44.0 | 57 | + 10 | |
| | ° ′ | ° ′ | ° | ° | |
| Feb. 6 | 42.53 N. | 52.49 W. | 38 | — 3 | Ship "Philadelphia," Capt. Stotesbury,— |
| 7 | 43.58 | 48.08 | 31 | — 7 | New York to Liverpool. 1850. |
| 8 | 44.37 | 43.44 | 57 | + 26 | |
| | ° ′ | ° ′ | ° | ° | |
| Dec. 19 | 40.46 N. | 68.24 W. | 46 | | |
| 20 | 42.55 | 62.50 | 50 | + 4 | |
| 21 | 44.23 | 56.54 | 40 | — 10 | |
| 22 | 46.50 | 51.24 | 40 | 0 | |
| 23 | 48.50 | 44.55 | 30 | — 10 | Royal Mail Steamer "Asia," Capt. Judkins, from New York to Liverpool. 1850. |
| 24 | 50.41 | 37.52 | 46 | + 16 | |
| 25 | 51.22 | 29.27 | 52 | + 6 | |
| 26 | 51.34 | 20.48 | 53 | + 1 | |
| 27 | 51.17 | 12.59.45 | 57 | + 4 | |

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EXTRACT FROM ABSTRACT LOGS—*Continued.*

| 1850. | Latitude. | Longitude. | Temperature of water. | Change of Temperature. | |
|---|---|---|---|---|---|
| | ° ′ | ° ′ | ° | ° | |
| Dec. 17 | 40.10 | 55.51 | 68 | — 3 | |
| 18 | 42.02 | 52.30 | 47 | — 21 | Ship Argo, Captain Crawford,—New York to Havre, 1849. |
| 18 | 42.52 | 48.48 | 38 | — 9 | |
| 20 | 43.00 | 45.40 | 37 | — 1 | |
| 21 | 42.33 | 45.26 | 61 | + 24 | |

These extracts are taken at random. They will give those who have not access to the charts, some idea of the changes of temperature in these streaks of cold and warm water. They will also afford a clue as to the frequency with which these cold and warm streaks change their positions.

There is on this route a peninsula of cold water, which hangs down into the Gulf Stream like a curtain dropped from the North. Its position as well as its dimensions vary. It often covers several degrees in extent—and it affords instances of the greatest and most sudden changes that are known to take place in the temperature of the surface waters of the sea. It is generally found about the parallel of 45°, and the meridian of 50°. Covering frequently an area of hundreds of miles in extent, its waters differ as much as 20°, 25°, 30°; and in rare cases even as much as 35° of temperature from those about it.

These waters doubtless came down from the cold regions of the North, and are perhaps in the strongest part of that current.

The bottom of the sea in that region,—the Grand Banks,—assist, no doubt, in forcing this mass of cold waters to the surface; and the fact that they penetrate far down across the usual track of the Gulf Stream, seems to indicate that their momentum here is greater than the momentum of the warm waters of the Gulf Stream, which they push aside.

Between this peninsula of cold water and Newfoundland there is a layer or branch of warm waters; perhaps, these are brought there by a bifurcation of the Gulf Stream. Here we have clearly and unexpectedly unmasked the very seat of that agent which produces the Newfoundland fogs. It is over an area frequently embracing several thousand square miles in extent, covered with cold water, and surrounded on three sides with an immense body of warm. May it not be that the proximity to each other of these two very unequally heated surfaces out upon the ocean, would be attended by atmospherical phenomena not unlike those of the land and sea breezes? These warm currents of the sea are powerful meteorological agents. I have been enabled to trace in thunder and lightning, the influence of the Gulf Stream in the Eastern half of the Atlantic, as far North as the parallel of 55° N.; for there in the dead of winter a thunder storm is not unusual.

Reviewing now what has been said concerning the layers of cold and warm water along the European route of the Gulf Stream, and returning to the cool and warm streaks mentioned by Lieut. Walsh, and the



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officers of the Coast Survey: it appears probable that the warm waters which they encountered and reported as coming from the Gulf Stream, are the warm waters properly due the latitude, partly interlacing the cooler waters of the same regions in the seasons described. The difference of temperature may be partly due, also, to the warm waters of the surface being separated into streaks by the cooler waters of the submarine current which by the agitation of the ocean are here and there brought to the surface through the thin layer of warm surface water.

If we draw a line of a degree or two in breadth from the capes of the Chesapeake and the Delaware Bays towards Cape St. Roque in Brazil, we shall find in this direction, after crossing the Gulf Stream, a layer of water a little cooler than that on either side of it. This layer extends to the equator, and is sometimes very clearly marked:—so much so that I have been at a loss to account for it. Like an immense lake, it is surrounded with waters of a higher temperature. It cannot therefore be brought there by a cold surface current. It is strictly a *layer*, in contradistinction to a current.

The only idea that has suggested itself in explanation of this phenomenon is in the conjecture that there may be stretching off in this direction, a submerged mountain range or ridge at the bottom of the sea, across which the cold waters of this submarine current as it forces itself into the Caribbean sea, are brought to the surface by the agitation of the waves.

Standing out like peaks in this range are the Islands of Fernando de Noronha, the Penedo de San Pedro, and the Bermudas. The Islands and mountains of Cuba, occupy a position which a mountain spur from this sunken range might be supposed to occupy.

Lieut. Walsh, in the "Taney," was directed to run across this supposed submarine range of mountains, a zig-zag line of deep-sea soundings, from the equator to the capes of Virginia. But unfortunately his schooner proved unseaworthy, and he had to abandon this interesting part of his work.

Captain Powell of the U. S. S. "Jno. Adams," in 1850, found himself on a shoal in the South Atlantic, and the fact was first made known entirely by the change in temperature of the surface water. Finding the water to become cool, he got a cast of the deep sea lead and found bottom. These facts, as far as they go, give some sort of plausibility to the conjecture.

The isotherms of 60°, 50° and 40°, take a northeastwardly direction across the Atlantic, and show the waters of the ocean to be as warm, indeed warmer, between latitude 60° and 65° off the shores of Europe than they are on this side near the parallels of 40° and 45°.

That the Gulf Stream is roof-shaped: that is, it is higher in the middle and lower at the edges—and that it has a roof-current running from the middle or axial line to either edge, as suggested in 1844, has been proved by experiments since made with regard to it by officers of the navy.

Thus in lowering a boat to try the current, they found that the boat would invariably be drifted towards one side or the other of the stream, while the vessel herself was drifted along in the direction of it. Now were it possible to make a vertical section across the Gulf Stream, the top of it would appear convex and the bottom concave, unless where the bottom of it reaches the bottom of the sea.

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This feature of the Gulf Stream throws a gleam of light upon the *locus* of the Gulf weed, by proving that its place of growth cannot be on this side of the middle of that stream. No Gulf weed is ever found West of the thread of the Gulf Stream; and, if we admit the top of the stream to be higher in the middle than at the edges, it would be difficult to imagine how the Gulf weed should cross it, or get from one side of it to the other.

The inference therefore would be, that as all the Gulf weed which is seen in the stream is on its eastern declivity, the *locus* of the weed must be somewhere within or near the borders of the stream, and to the East of the middle. And this idea is strengthened by the report of Captain Scott, a most intelligent shipmaster, who reports to me that he has seen the Gulf weed growing on the Bahama Banks. I have specimens of it which he had the kindness to send me, with seed vessels, plucked up from the bottom while at anchor on the edge of the Gulf Stream. Hence we account for the fact that the Gulf weed should be seen on the Eastern and not on the Western borders of the Gulf Stream.

It is proposed to construct from the same journals, which give the temperature of the air, also, another set of thermal charts which shall relate to the temperature of the atmosphere over the ocean, though Professor Dove, by means of his valuable thermal charts of the atmosphere, has rendered this labor much less interesting than in the absence of his exquisite work it would have been; for it has already been shown by my charts, in connection with his, that the remarkable bending of his isotherms as they enter the land along the western shores of Northern Europe and America, is owing in a great degree to the manner in which the aqueous curves of equal temperature approach those shores.

Letter E of the series,—the Storm and Rain Charts,—was commenced for the North Atlantic by Lieutenant Wm. Rogers Taylor, U. S. N., and in his absence at sea, has been continued by Lieutenant Wm. H. Ball.

The object of these charts is to show the total number of observations that have been made for each month, in every space of 5° square in the ocean; and then to show, for every square and month, the number of days each in which there was a rain, a calm, a fog, thunder and lightning, or a storm and the quarter whence it blew.

This series is not yet ready for the press, though a vast amount of labor has been bestowed upon it as well as the others.

The manner in which these observations are collected from the quarry of log books;—brought together and discussed;—and the officers at work upon them, reminds one of the sculptor: any single touch of the chisel, however well directed, does but little towards developing the figure which in due time is to stand out from the rude mass; so with these observations: any single one however accurate, is in itself worth but little. It is only by oft-repeated observations multiplied and brought together in sufficient numbers to express their own meaning, that results can be obtained. Then, like the piece of statuary, the charts speak for themselves, and all at once stand out before the compiler, eloquent with facts which the philosopher never dreamed were lurking near.

Among the various phenomena presented in the course of these investigations, some have pointed to the

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moon and suggested the inquiry: Has the declination of the moon any influence upon the bands of trade winds and calms, by moving the edges of their zones up and down the ocean?

The abstract logs will in the course of time afford observations enough probably to enable me to answer this question, for it is one of those questions to which a satisfactory reply, either in the affirmative or negative is equally desirable.

The investigation of this problem has been assigned to Passed Midshipman Mathews. He is confined in it to the Atlantic. But I am apprehensive that the true answer to the question will be so masked by the effects of other causes in moving these trade wind bands up and down the ocean, that its purport will not be perceived.

Perhaps the Pacific ocean, when there shall be observations enough made in it, will enable me to put this question to rest.

By an act of Congress, approved March 3d, 1849, the Secretary of the Navy was authorized to assist me in this undertaking to investigate the phenomena of the winds and the waves. The following is the joint resolution which expressed the wishes of Congress in the matter:—

"SECTION 2. *And be it further enacted*, That the Secretary of the Navy be directed to detail three 'suitable vessels of the navy in testing new routes and perfecting the discoveries made by Lieut. Maury in the 'course of his investigations of the winds and currents of the ocean; and to cause the vessels of the navy to 'co-operate in procuring materials for such investigations, in so far as said co-operation may not be incom-'patible with the public interests: *Provided*, That the same can be accomplished without any additional 'expense."

But one vessel has been ordered out upon this service, and she unfortunately proving utterly unseaworthy, her cruise was broken up before it was half completed.

The U. S. Schooner "Taney," Lieut. J. C. Walsh commanding, was the vessel detailed for this service, and her unfitness for it is the more to be regretted as her officers one and all, entered upon this field of research with so much spirit.

The "Taney," well equipped for this interesting service, sailed from New York in October, 1849.

By desire of your predecessor in office, I drew up a programme of instructions for her. They were issued by him, and are hereunto annexed, and marked A.

The abstract log kept by the Taney, and returned to this office, is also annexed. It is marked C.

The discovery by Lieut. Walsh of a submarine current, of great velocity; of water in the depths of the ocean which when brought to the surface, relieved of pressure and reduced to the surface temperature, was found to be lighter than the surface water;—and that the greatest depth of the North Atlantic ocean, probably exceeds six miles and a half, are some of the most interesting results of this highly interesting cruise.

On November 15th, 1849, in latitude 31° 59′ N., longitude 58° 43′ W., Lieut. Walsh with his sounding wire obtained a cast of 5700 fathoms = 34,200 feet or 6.48 miles without reaching bottom. This is the greatest depth ever attained, and would show that the greatest depths of the ocean exceed the greatest elevations of the land by more than one mile at the least. It is very desirable to have this sounding verified.

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For a detailed account of his observations and experiments, of the manner in which they were conducted, and of the results obtained, I refer you to a letter received by me from that officer, marked B, and hereunto annexed.

It is earnestly hoped that the Department will at an early day direct these experiments and researches upon which the "Taney" was engaged, to be renewed.

There is frequent mention made in the log books of extraordinary "tide-rips" near the equator in the Atlantic.

These tide-rips have been seen in a calm, to approach the shore with a roaring noise, bringing with them over the unruffled surface of the sea immense waves, that break against the vessel, throwing their spray on the deck; they pass on, and leave the surface of the sea as smooth as ever.

These, and other phenomena, will form subjects, at the proper time, of special investigation.

In the mean time, orders have been issued by Commodore Warrington, chief of the Bureau, for every vessel in the Navy to get a deep-sea sounding daily, in whatever part of the ocean.*

For this purpose they are supplied with a quantity of sounding twine, and are authorized to use a thirty-two-pound shot as a weight. The shot, with the twine attached to it, is cast overboard, and the line is drawn from a reel as fast as the shot will take it. When the shot ceases to take the line, it is cut; and, by knowing the quantity left, the quantity taken out gives the depth.

The expense is only the loss of the shot, and as much twine as it requires to reach the bottom.

The degree of strength required for the twine was a matter of experiment, and it has turned out that the twine selected, which had the strength in short pieces to lift a thirty-two pound shot, was not strong enough.

The United States ship Albany, Capt. Platt, is the only vessel which as yet has reported results. I refer you to his letter marked E, and hereunto annexed, reporting to Commodore Warrington the results of his experiments.† I copy also Lieut. Taylor's admirable account of them, and of the difficulties which he encountered, and of the expedients to which he resorted, in the hope that his experience and ingenuity may benefit others who may have the kindness to assist in solving satisfactorily the problem as to the depth of the ocean.

*Account by Lieutenant Wm. Rodgers Taylor of deep-sea soundings taken on board the U. S. ship Albany, commander Platt, by order of Commodore Lewis Warrington, Chief of the Bureau of Ordnance and Hydrography*, 1850.

| Date. | Lat. Obs. N. | Lat. D. R. N. | Long. Obs. W. | Long. D. R. W. | Fathoms. | Time running out. | Temp're. Air. | Temp're. Water. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| 1850. | ° ′ | ° ′ | ° ′ | ° ′ | | | ° | ° | |
| Dec. 6. | — | 38 38 | — | 66 31 | 1625 bottom | 27 minutes | 61 | 68 | |
| 7. | 37 09 | — | 64 59 | Too rough to sound | | | | | |
| 8. | 35 14 | — | 63 01 | | | | | | |
| 9. | — | 33 34 | — | 61 38 | 1950 bottom | 1 hour 3 m. | 68 | 72 | Drift 1 mile |

* See paper D.

† See paper E.



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"MEM.—9th.—We lost six shot in attempting to sound to-day, owing to the heavy swell, which caused the line to snap when the ship rose abaft. We then tried a bar of iron which weighed about twelve pounds, which descended more rapidly than the shot; but the line failed and snapped. At length we resorted to a thirteen pound lead, and got bottom as above. The light weight of the lead caused the line to go out very slowly towards the last, but I have no doubt of the sounding. I set the drift at about one mile, from which you can easily calculate the perpendicular depth. The first day we lost one shot only by the parting of the line; the second attempt was entirely successful.

"10th. Lat. obs. N. 31° 6′. Long. D. R. W. 61° 15′. Too rough for sounding.

"11th. The experiments of to-day have cast a doubt over the former soundings, and I am now uncertain whether we have ever obtained bottom. This forenoon we got, as I supposed, an excellent cast, and the line stopped running out at 1,000 fathoms; the strain was very great upon the line, when it was pulled upon, but as the breeze was light, it was some minutes before it parted. I felt confident that we got bottom at the time. But this afternoon there was as perfect a calm as I ever saw; we thought it would be well to verify the cast of the forenoon, and renewed the soundings; the line stopped running out at 1,500 fathoms, and the ship had not drifted apparently ten yards; the line was up and down. But upon pulling upon it, the line came in gradually, though very heavily; indeed, sufficiently so as to cause me to believe that if the ship had had headway it would have parted. And yet we hauled in some three hundred fathoms, the weight diminishing as it rose, but with no sudden relief of strain, as if the line had snapped. It at once occurred to me that if the shot had broken the line at that depth, the effect upon the reel would have been the same, and it became doubtful whether we had got bottom in this, or in any other sounding. We have lost eleven shot to-day; once the line snapped at 300 fathoms, and once at 600 fathoms. I ought to say, rather, that the knots made by the rope-makers slipped. The twine seems to be of unequal strength, and sometimes parts without the slightest apparent cause; it may be that the knots have slipped on such occasions. I know that some knots have slipped, from hauling in the end, and finding it cut square off, whereas a fracture always leaves the strands of different lengths at the broken end. We have, at last, learned how to start the shot fairly, which is a point of great importance. Take three parts of the twine, for about fifteen fathoms, and lower the shot into the water carefully; hold back the reel (which is fitted with a crank, and stands upon a support,) until it takes the whole weight of the shot upon the three parts, eight or ten fathoms of which remain upon the reel; when all ready, let go the crank, and the shot descends without jerking; it is necessary to have a compressor upon the edge of the reel, to keep it from revolving too rapidly, as the line is apt to run off and get foul in such cases; a piece of old canvas in a man's hand, is probably the best thing of the sort that can be used. I am well satisfied with our reel, (which was made by Capt. Platt's direction at the Boston Navy Yard,) and am also satisfied of the entire practicability of this mode of sounding, if you can get us *good* line; by good, I mean of *equal* strength. I send you a specimen of our twine, which easily bears the shot, but in some cases has parted with it when there has been no jerk, and no unusual duration of the strain. I should think that you might have good twine made of this size, of fine flax, and carefully knotted, or spun in one length, which would answer every requirement.

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"Lat. obs. 30°05′ N., long. chro. 58°52′ W. Line run out 1,000 faths. Time running out 11 minutes. Temp. air 78°. Temp. water 74°. Lat. obs. 29°58′ N., long. 58°48′ W. Line run out 1,500 faths. Time running out 28 minutes. Temp. air 72°. Temp. water 74°.

"December 12th. The experiments in sounding to-day have been signally unfortunate, and I much fear that no satisfactory result will ever be obtained with the line we have. In fact, it is only throwing away the shot, and is moreover a complete loss of time. We lay to two hours to-day, and achieved nothing.

"The 1st shot parted after running 7 minutes, at a depth of 600 fathoms; the fracture took place near the surface, and I send you the end that we hauled up. You will see how it untwisted, although it did not break there. The twisted end, with a single knot upon it, is where it broke, I think there was a knot there which slipped.

"The 2d shot parted at about 20 fathoms below the surface; no jerk, and the reel running freely. I send you the end that we hauled up, it has two knots near it. You will see that both this and the former are clean, sharp, cut ends. I think that this also was knotted and slipped.

"The 3d shot parted the line between the reel and my hand, when it had ascended 300 fathoms, and had been running about 2½ minutes. I send you the end, which has three knots near it. It is a decided break; though there was no reason why it should have broken: the reel was running freely, and no strain upon the line. It is though evidently a weak spot.

"The 4th shot parted the line at a great depth, when it had run out 550 fathoms, and had been running 5 minutes.

"The 5th shot parted in the same way, after 200 fathoms had run out.

"In these five experiments the line was *oiled.*

"The 6th shot parted the line after 200 fathoms had run out; the oiling was dispensed with in this case.

"The seventh and last sounding was made with an unoiled line, with three bars of iron lashed together, about 18 inches long, and weighing about 12 lbs. The line parted after running out 1,000 fathoms between the reel and my hand, when the weight was descending very slowly indeed; there was scarcely strain enough to turn the reel; it is evidently a *slip*, as you may see from the end, which I send you; it has seven knots near it. It had been running 22 minutes.

"I also send you two specimens, cut from our twine, to show you what sort of stuff has been sent to us. As a matter of strict fact, we are somewhat to blame for the slipping of knots, although we had no reason to suspect that they would slip before yesterday. Still, the makers should be rowed-up for being so faithless. By the way, we did not get the line until a day or two before we sailed, and had no chance to examine it carefully, and were even obliged to mark it in the greatest hurry. Capt. Platt was informed that it would be sent to him marked at every thousand fathoms, but it did not have a mark upon it. Send us good line, and we will give you as many soundings as you wish. The captain is much interested in the experiments, as you may see from the expenditure of shots; we have lost 25 in these few experiments, enough to show that the line is not trustworthy. A light weight gives very uncertain soundings, by reason of the great length of time it takes to run out, and the great drift in consequence.

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"December 16th. For several days past we have been overhauling the line, re-knotting it, and *waxing* it; to-day we made another experiment; the line run well, and parted at 1,600 fathoms. I have no doubt that the wax was of service to it, but the line is not suitable, and we did not deem it expedient to try it again to-day.

"Lat. obs. 21°34′ N.; long. chro. 63°24′ W. Temp. air 84°. Temp. water 81°. Time the line was running out, 28 minutes."

The U. S. Ship "Saratoga," Captain Walker, bound to the East Indies, was furnished with 100,000 fathoms of twine, of triple strength, for deep-sea soundings,—but much to my regret, I have not heard of a single cast by that vessel. She crossed the Atlantic nearly twice, on her way to Rio; and, having to cross it again thence to the Cape of Good Hope; a line of deep-sea soundings by her would have been of exceeding value. It is to be hoped she did not neglect them. The twine provided is measured, marked and wound on reels of 10,000 fathoms each, and the length of the line required to reach the bottom, is known by the quantity that remains on the reel after each cast.

It is hoped that the deep-sea soundings to be taken under this order will enable us to determine the shape of the great oceanic basins.

Letter F of the series—"The Whale Charts"—relates to the places of resort of the whale,—sperm and right,—according to the months.

These charts were commenced for the whole ocean in 1847, by Lieut. William L. Herndon—He was interrupted in these highly interesting investigations, by orders for sea service. He had proceeded far enough however with the charts to develop some of the first fruits, which, it might be expected, are concealed in a field so abundant with treasures as this may be well supposed to be.

The plan of conducting these investigations is by spaces of 5° square, and the observations are so entered as to show at a glance the number of days for each month spent in each square; the number of days in which whales—and whether they are sperm or right—are seen; also, the years in which whales of either kind were seen, and the years in which they were not seen in any given square.

As observation after observation in such an immense field was recorded day after day, with the most untiring industry, and as the oft-repeated process finally began to express a meaning, I was surprised to find the lines for entering the right whales through certain districts of the ocean, were blanks, from one side of the chart to the other. Finally it was discovered that the torrid zone is to this animal forbidden ground, and that it is physically as impossible for him to cross the equator as it would be to cross a sea of flame. In short, that there is a belt from two to three thousand miles in breadth, and reaching from one side of the ocean to the other, in which the right whales are never found.

Hence the discovery that the fish called the right whale in the Northern hemisphere is not the fish which goes by this name in the Southern. That the right whale of Behring's Straits and the whales of Baffin's Bay are probably the same animal; and if so, that there is at times at least, an open water communication through the polar regions between the Atlantic and Pacific oceans, for this animal not being able to endure

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the warm waters of the equator, could not pass from one ocean to the other unless by way of the Arctic regions.

The investigations connected with these animals have also pointed out to us the great currents of warm water which keep up the ocean circulation of the Pacific—it might be said of the globe; for as we study their habits, these dumb creatures teach us by their instincts that there are continuous currents in the sea between places the most remote.

With the aid of what the whales have taught us, in connection with what we have learned from other sources, we can now *almost* prove the existence of a continuous current of water from the borders of the Red Sea into the English Channel. The current, which has its genesis partly in the Red Sea, and partly in the Indian Ocean and its contiguous bays, is bifurcated off the African coast, by a cold current from the South. And were it possible to throw into the Red Sea two bottles properly marked and labelled, which would not be drifted out of the current, but which would separate at the forks of the stream, these two bottles would, or might pass, one around Cape Horn, the other around the Cape of Good Hope;—and, meeting again in the tropical regions of the Atlantic Ocean, it would theoretically be possible for them to drift into the Caribbean Sea;—thence through the Gulf of Mexico;—and by the Gulf Stream out again into the Atlantic Ocean;— and by its waters to be cast up together on the shores of the British Islands, as the drift of the Gulf Stream is often cast.

There is an under current from the Red Sea, and the course of the supposed bottles would be with that under current out into the Gulf of Aden;—thence, rising to the surface in the Arabian Sea—an immense cauldron without any escape, as from our Gulf of Mexico, for its heated waters to the North,—they would be drifted to the South in the currents from this sea: arrived near the Cape of Good Hope, this current is bifurcated by a cold one from the South going to replace the waters which it has conveyed from the North.

Here the bottles would separate, one following the Lagullas current around the Cape of Good Hope into the Atlantic.

The other taking the other branch of the stream, would be drifted to the southward of New Holland, and be carried into the Antarctic regions near Victoria's land. Here the current being cooled down and deflected, it would commence its flow toward the North in the ice-bearing current which flows into the Atlantic around Cape Horn,—the icebergs of which I have encountered in latitude 37° South. Bottles that have been thrown overboard off Cape Horn, have been picked up on the shores of Ireland.

However, without pursuing just now this system of currents pointed out by the bottles and the whales, I propose at another time a still further investigation into these beautiful and interesting facts which the Whale Charts are developing.

After Lieut. Herndon was called away, the investigations for these charts were continued by Lieut. Leigh. His duties having been since changed, Lieut. Fleming is now at work upon the "Whale Charts," and preparations are in progress for putting them to press.

They will show in what parts of the ocean the whales "use" in each month, and the knowledge cannot

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fail to prove of great importance to the whaling interests of the country,—an interest which keeps in continual occupation a fleet of 600 sail manned by 15,000 American seamen—and which fishes up annually from the depths of the ocean, property the real value of which far exceeds that of the gold mines of California.

Respectfully, &c.,

M. F. MAURY,

*Lieut. U. S. N.*

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*On the probable Relation between Magnetism and the Circulation of the Atmosphere.*

JANUARY 30, 1851.

The discoveries of Faraday in dia-magnetism are calculated to guide me and to illuminate the darkness in which I have found myself so often surrounded, as I endeavored to follow the "wind in his circuits" over the trackless wastes of the ocean.

Oxygen composes one-fifth part of the atmosphere and is magnetic.

The discovery that it is magnetic, presents itself to the mind as a great physical fact which is to serve as the key stone for some of the most grand among the sublime and beautiful structures which philosophy is erecting for monuments to the genius of the age.

The facts elicited from the Wind and Current charts, had already pointed me to the work of some agent whose office in the grand system of atmospherical circulation was neither understood nor recognized.

In following these facts to their legitimate conclusions, and in studying all the phenomena that these charts have successively revealed touching the grand system of the distribution of moisture and the circulation of the atmosphere over the surface of the earth, I have often been induced to suspect that some other agent besides heat and the rotation of the earth on its axis, was concerned in the matter.

Never suspecting the character of this agent, its foot prints have at least been detected; and there is reason to suppose that Faraday has discovered its lurking place to be in the oxygen of the atmosphere.

These charts had enabled me to trace from the belt of calms, near the tropic of Cancer which extends entirely across the seas, an efflux of air both to the North and to the South; from the South side of this belt the air flows in a never-ceasing breeze, called the N. E. trade winds, towards the equator.

On the North side of it, the prevailing winds come from it also; but they go towards the N. E. They are the well known southwesterly winds which prevail along the route from this country to England in the ratio of two to one.

Now these last named winds are going from a warmer to a colder climate; and therefore it may be supposed that nature exacts from them what we know she exacts from the air under similar circumstances, but on a smaller scale before our eyes, viz: more precipitation than evaporation.

Where then does the vapor, which these winds carry along, come from? was one of the questions suggested by the charts.

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We saw that the air of which the N. E. trades winds are comprised, and which comes out of the same zone of calms, as do these southwesterly winds, so far from being saturated with vapor at its exodus, was dry;—the N.E. trade winds are for the most part dry winds;—we perceived that going from a lower to a higher temperature their evaporating powers were increased; that they had to travel in their oblique course, towards the equator, a distance of near 3000 miles; that as a general rule they evaporated all the time, and all the way, and precipitated little or none on their route; that they were not saturated with moisture until they had arrived fully up to the region of equatorial calms, a zone of constant precipitation.

This calm zone of Cancer borders also, it was perceived, upon a rainy region.

Where then does the vapor, which is here on the northern edge of this zone of Cancer, condensed into rains—and where also does the vapor which the rain winds that flow out on the polar side of this zone—where? was the oft-repeated question,—does the vapor which is condensed into rains for the extra tropical regions of the North, come from?

It might possibly be taken up by the N. E. trade winds; and it might be the residuum, which, after supplying the equatorial calms with their rain, was carried up in the ascending column of air there, and which residuum was brought back in the upper regions of the atmosphere by the current which we know perpetually blows up there, counter to the trade winds.

We know that there is an upper current of perpetual winds from the equatorial to the tropical calms,—that the volume of air moved by these two upper currents, North and South, to Cancer and Capricorn, is equal to the volume that is felt on the surface, as the N. E. and S. E. trade winds.

I knew of no law of nature which would forbid the supposition that the air which has been brought down as the N. E. trade winds to the equatorial calms, should, after ascending there, return by the counter and upper currents to the calm zone of Cancer, here descend and re-appear on the surface as the N. E. trade winds again. I knew of no agent in nature which would *prevent* it from taking this circuit; but while I knew of no agent in nature that would prevent it from taking this circuit, I knew on the other hand, of circumstances which rendered it probable that such in general is not the course of atmospherical circulation—that it did not take this circuit. I speak of the rule, not of the exceptions; these are infinite, and for the most part are caused by the land.

And I moreover knew of facts which greatly strengthen the supposition, that after arriving at the calms of Cancer and descending, the winds which have come in the upper regions of the atmosphere from the Equator, do not return to the Equator on the surface, but continue on the surface towards the pole.

And these are the circumstances which favor the conjecture that the winds which flow in the upper regions of the atmosphere from the Equator to the calms of Cancer, do not, after arriving and descending in the midst of these calms, turn about and go back to the Equator with the N. E. trades: on the contrary, these are the facts and circumstances which give strength to the supposition that they continue on towards the pole, as the prevailing southwesterly winds of the extra tropical North:

We have seen that on the North side of this calm zone of Cancer, the prevailing winds on the surface are from this zone towards the pole; in other words if $s$ represent the total volume of atmosphere which blows on

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the surface towards the North on the polar side of Cancer, and $\phi$ the total volume which moves on the surface from the pole towards the calms of Cancer, then $s$ being the rule and $\phi$ the exception, we shall have $s > \phi = s'$. Therefore $s'$ is the quantity which must return in the upper regions of the atmosphere from the Arctic regions to the calm zone of Cancer; and if we take $s''$ as the quantity which comes from the equator in the upper regions of the atmosphere to this same zone of calms, we shall have the momentum of $s''$ equal to the momentum of $s'$ as proved by nature in the fact that she has established near each tropic, a zone, or belt of calms.

The Cancer zone of calms in the Atlantic ocean is known to American seaman as the "Horse Latitudes," from the circumstance that the vessels formerly engaged in carrying horses from New England to the West Indies, found it so difficult to cross this zone: they would often be detained in the calms for many days, during which time the large cargo of horses would exhaust the stock of water, become frantic with thirst, and to save a part, the rest would have to be thrown overboard; hence the name of "Horse Latitudes" to the calms near the tropics of Cancer, and which I have called by the name of that sign.

This is the place where the upper currents of air represented by $s'$ and $s''$ meet; they balance each other, produce a calm, and descend to re-appear as surface winds, one blowing to the North and the other to the South from this calm belt.

Now $s'$ could not bring the vapors here which form the rains that are precipitated between this calm belt and the polar regions, because $s'$ had already performed the circuit as a surface wind between this zone and those regions; it had been subjected to a temperature far below zero, and had given out all the moisture that a dew point so very low could extract from it; and as it had returned in the upper regions of the atmosphere where it encountered no fluid surface to replenish it with moisture, it had no vapor on its arrival from the North at the calms of Cancer, to make rains of.

Hence if $s'$ returned to the North as a surface wind after descending in the calm zone of Cancer, it would first have to remain a long time in contact with the sea, in order to be supplied with vapor enough to fill the great rivers and supply the rains for the whole earth between us and the North Pole.

In this case we should have an evaporating region on the North as well as on the South side of this zone of Cancer; but the charts show no such region; I speak exclusively of the ocean.

Therefore I inferred that $s'$ does not come out on the North side of this calm zone, but on the South side; thence to take the circuit of the N. E. trade winds, and to be replenished with vapor; and if it be admitted that such is the general course of $s'$ it must of necessity be admitted that $s''$ must re-appear on the North side of this zone as the prevailing surface wind which precipitates on its way to the Arctic regions, the residuum or vapor that it has taken up in the trade-wind region, and brought from the equatorial calms.

Moreover, if $s''$ have the vapor which by condensation is to water with showers the extra tropical regions of the Northern hemisphere; nature, we may be sure has provided a guide for conducting $s''$ across this belt of calms and for sending it on in the right way. Here it is that I saw the foot prints of an agent whose character I could not comprehend. It was this guide.

Heat and cold, the early and the latter rain are not distributed over the earth by chance; they are dis-

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pensed no doubt according to design, and in obedience to laws that are as certain and as sure in their operations as the morning stars in their songs of praise.

If there were really a general mingling in the calms of Cancer, of the atmosphere which comes from the North with that which comes from the South—of the moist and the dry air as it descends here to the surface of the earth—if it depended upon chance whether the dry air should come out on this side, or on that, of the calms of Cancer;—or whether the moist air should return whence it came or not;—if such were the case in nature, we perceive that so far from any regularity as to seasons, we should have, or might have years of droughts the most excessive, and then again seasons of rains the most destructive; but so far from this we find for each place a mean annual proportion of both, that year after year is preserved with remarkable regularity.

Therefore, seeing reasons why $s'$ and $s''$ should cross each other in the calms of Cancer, and seeing no reasons why they should not, I was led to the inference that here probably is a node in the circulation of the atmosphere, where the wind from the North meets the wind from the South, and that each after a pause, continues on its course and returns again to complete his circuit. The fact, it appeared to me, was probable, but the cause a mystery; that is, did this crossing of currents not take place, here would be a barrier in the atmosphere: and we, the inhabitants of the extra tropical regions of the North, would have an atmosphere, between the calms of Cancer and the pole, always to breathe.

Having thus shown that there is no reason for supposing that the upper currents of air when they meet over the calms of Cancer and Capricorn, are turned back to the equator; but having shown that there is reason for supposing that the air of each current after descending, continues on in the direction towards which it was traveling; we may go farther, and by a similar train of circumstantial evidence, afforded by the charts and other sources of information, show that the air moved on the surface by the two systems of trade winds, when arrived at the belt of equatorial calms, and having ascended, continues on thence, each current towards the pole which it was approaching while on the surface.

There is no reason for supposing that the atmosphere does not pass freely from one hemisphere to another; on the contrary many reasons for supposing that it does, present themselves.

If it did not the proportion of land and water, and consequently of plants, and warm blooded animals being so different in the two hemispheres, we might imagine that the constituents of the atmosphere in them would in the course of ages probably become different, and that consequently in such a case man could not safely pass from one hemisphere to the other.

I considered the manifold beauties in the whole system of terrestrial adaptations:—I reflected what a perfect and wonderful machine is this atmosphere:—how exquisitely balanced and beautifully compensated it is in all its parts,—we all know that it is perfect:—that in the performance of its manifold offices it is never once left to the guidance of chance—no, not for a moment:—therefore I was led to ask myself why the air of the N. E. trades when arrived at the zone of equatorial calms, should, after ascending, rather return to the North than the South. Where and what is the principle upon which its course was decided.

Here again I found circumstances which induced me to suppose it probable that it neither turned back to



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the North, nor mingled with the air which came from the region of the S. E. trades, ascended, and then flowed indiscriminately to the North or the South.

But I saw reasons for supposing that what came to the equatorial calms as N. E. trade winds, continued to the South as an upper current; and that what had come to the same zone as S. E. trade winds, ascended and continued over into the Northern hemisphere as an upper current, bound for the calm zone of Cancer.

And these are the principal reasons upon which this supposition was based.

At the seasons of the year when the sun is evaporating most rapidly in the Southern hemisphere, the most rain is falling in the Northern. Therefore I supposed that much of the vapor which is taken up there is precipitated here.

The evaporating surface in the Southern hemisphere is greater, much greater than that in the Northern: still all the great rivers are in the Northern hemisphere;—the Amazon being regarded as common to both. And this, as far as it goes, is corroborative of the above.

Independently of other sources of information, the charts taught me to believe that the mean temperature of the tropical regions was higher in the Northern than in the Southern hemisphere; for they show that the difference is such as to draw the equatorial edge of the S. E. trades far over on this side of the equator, and to give them force enough to keep the N. E. trade winds out of the Southern hemisphere almost entirely.

Consequently, as before stated, the S. E. trade winds being in contact with a more extended evaporating surface, and continuing in contact with it for a longer time or through a greater distance, they would probably arrive at the trade wind place of meeting, more heavily laden with moisture than the others.

Taking the laws and rate of evaporation into consideration, I could find no part of the ocean of the Northern hemisphere from which, according to the indications of the charts, the sources of the Mississippi, the St. Lawrence and the other great rivers of our hemisphere could be supplied.

It appeared to me, therefore, that the extra-tropical regions of the Northern hemisphere stood in the relation of a condenser to a grand steam machine, the boiler of which was in the region of the S. E. trade winds, and that the trade winds of this hemisphere performed the like office for the regions beyond Capricorn.

The calm zone of Capricorn is the duplicate of that of Cancer, and the winds flow from it as they do from that: both North and South: with this difference, that on the polar side of the Capricorn belt they prevail from the N. W., instead of the S. W., and on the equatorial side from the S. E., instead of N. E.

Now if it were so, that the vapor of the N. E. trade winds were condensed in the extra-tropical regions of the Southern hemisphere, the following path, on account of the effect of diurnal rotation of the earth upon the course of the winds, would represent the mean circuit of a portion of the atmosphere moving according to the general system of its circulation over the Pacific ocean, viz: coming down from the North as an upper current, and appearing on the surface of the earth in about longitude 130° W., and near the tropic of Cancer, it would here commence to blow the N. E. trade winds of that region.

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Its course would be towards the equator somewhat in the direction of the King's Mill group of Islands. Meeting no land in this long oblique track over the tepid waters of a tropical sea, it would, somewhere to the East of these Islands, arrive at the belt of equatorial calms which always divides the N. E. from the S. E. trade winds.

Here depositing a portion of its vapor as it ascends, it would with the residuum take, on account of diurnal rotation, a course in the upper regions of the atmosphere to the S. E. as far as the calms of Capricorn. Here it descends and continues on towards the coast of South America in the same direction, appearing now as the prevailing N. W. wind of the extra-tropical regions of the Southern hemisphere.

Travelling on the surface from warmer to colder regions, it must, in this part of its circuit, precipitate more than it evaporates.

Now this is the route by which, on account of the land in the Northern hemisphere, the N. E. trade winds have the fairest sweep over that ocean. This is the route by which they are longest in contact with an evaporating surface; the route by which all circumstances are most favorable to complete saturation; and this is the route by which they can pass over into the Southern hemisphere, most heavily laden with vapors for the extra-tropical regions of that half of the globe; and this is the supposed route which the N. E. trade winds of the Pacific take to reach the equator, and to pass from it.

Accordingly, if this process of reasoning be good, that portion of South America between the calms of Capricorn and Cape Horn, upon the mountain ranges of which this part of the atmosphere, whose circuit I am considering as a type, first impinges, ought to be a region of copious precipitation. I accordingly turned to the hyetography of Berghaus and Johnson, and find it stated on the authority of Captain King, that upwards of 12* feet of rain fell there in 41 days!

Passing the snow-clad summits of the Andes, this same wind tumbles down upon the Eastern slopes of the range, and then traverses the almost rainless and barren regions of Patagonia and South Buenos Ayres.

These conditions, the direction of the prevailing winds and the amount of precipitation were regarded as evidence afforded by nature, if not in favor, certainly not against the conjecture that such had been the voyage of this vapor through the air. At any rate here was proof of the immense quantity of vapor which these winds of the extra-tropical regions carry along with them towards the poles, and I could imagine no other place than that suggested, whence these winds could get so much vapor.

I am not unaware of the theory or of the weight attached to it, which requires precipitation to take place in the upper regions of the atmosphere on account of the cold there irrespective of proximity to mountain tops and snow-clad hills.

But the facts and conditions developed by these charts are in many respects irreconcilable with that theory. With a new system of facts before me, I have, independent of all preconceived notions and opinions, set about to seek among them for explanations and reconciliations.

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* 153 inches.

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Arrived at this stage in the process of deduction and finding conformity, the next step was to trace back the vapor that supplies the sources of the Mississippi river and its tributaries with rains, to its place in the ocean whence it came.

It rains more in the valley drained by that river than is evaporated from it again. The difference for a year is the volume of water annually discharged by that river into the sea.

At the time and place that the vapor which supplies this immense volume of water was lifted by the atmosphere up from the sea, it was reasoned that the thermometer stood higher than it did at the time and place where it was condensed and fell down as rain in the Mississippi valley.

I looked to the South for the springs in the sea which supply the fountains of this river with rain. But I could not find spare evaporating surface enough for it in the first place; and if the vapor, I could not find the winds which would convey it to the right place.

The prevailing winds in the Caribbean sea, and southern parts of the Gulf of Mexico are the N. E. trade winds. They have their offices to perform in the river basins of tropical America, and the rains which they may discharge into the Mississippi valley now and then are exceptions, not the rule.

The winds from the North cannot bring vapors from the great lakes to make rains for the Mississippi, for two reasons; first: the basin of the great lakes receives from the atmosphere more water in the shape of rain than they give back in the shape of vapor. The St. Lawrence river carries off the excess.

2d. The mean climate of the lake is colder than that of the Mississippi valley; and therefore, as a general rule, the temperature of the Mississippi valley is unfavorable for condensing vapor from that quarter.

It cannot come from the Atlantic, because the greater part of the Mississippi valley is to the windward of the Atlantic ocean. The winds that blow across it go to Europe with their vapors; and in the Pacific, from the parallels of California down to the equator, the direction of the wind at the surface is from, not toward, the basin of the Mississippi. Therefore it seemed to be established with some degree of probability—or if that expression be too strong—with something like apparent plausibility, that the rain winds of the Mississippi valley, as the general rule, do not get their vapors from the North Atlantic ocean, nor from the Gulf of Mexico, nor from the great lakes, nor from that part of the Pacific ocean over which the N. E. trade-winds prevail.

The same process of reasoning which induced me to look into the trade-wind region of the Northern hemisphere for the sources of the Patagonian rains, induced me to look in the trade-wind regions of the South Pacific ocean, for the vapor springs of the Mississippi.

I therefore last summer addressed a circular letter to the farmers and planters of the Mississippi valley, requesting to be informed as to the direction of the rain winds of each locality, and with the view of acquiring some idea as to the general hygrometric condition of the atmosphere, I asked also to be informed as to the kind and quality of fruits and the like.

To this I have received the following replies: —

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*From J. M. Janney, Warren county, Ohio.*

Lat. 39° 30′ N.; Long. 84° W.

Winds from the southwest, with but few exceptions, bring rain; this is the result of eleven and a half years' observation.

Farm situated between the Miami rivers. There are no mountains nearer than the Cumberland and Alleghany; the one lying in a southeast direction, and the other east of this locality. The nearest point to these elevations is perhaps not short of 225 or 250 miles. Lake Erie, situated about 100 miles north-east of us, is the nearest sheet of water.

The fruits are apples, pears, cherries, strawberries, raspberries, currants, gooseberries, quinces, and peaches. Grapes also thrive well. The products of the soil are maize, wheat, oats, flax, rye, and potatoes.

I may observe that the cold south winds often prevail through the winter; and during the spring *cool*, rather piercing northwest winds frequently assail us; during the prevalence of which drought is almost sure to exist. Snow-storms generally come from the southwest, but occasionally we have a heavy storm of this kind from the east. To me it is obvious that the winds that bring us rain sweep through the great Mississippi and Ohio vallies in their course northeast. [That is, they are southwest winds.]

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*From Wm. J. Payne, near Rushville, Rush county, Indiana.*

Lat. 39° 30′ N.; Long. 85° 30′ W.

The winds are various: the west wind sometimes brings most rain during some years; but the southwest winds are most prevalent, and bring rain the greatest number of years.

Fruits are, peaches, apples, pears, and cherries.

Productions—Corn, wheat, oats, rye, &c.

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*From Louis Moore, Carrollton, Mississippi.*

Lat. 33° 30′ N.; Long. 90° W.

On an average, the winds that bring us rain are the southwest. Farm situated in a hilly district, some 150 miles from the sea-coast. The most common fruits are apples, peaches, &c., and melons in abundance.

Agricultural staples are cotton, corn, oats, potatoes, &c.

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*From Turner Vaughan, La Guardo, Tennessee.*

Lat. 36° 30′ N.; Long. 86° 30′ W.

Winds S. by W. bring the most rain, and W.N.W. the most storms; the latter, however, are unfrequent here, and very partial, owing, perhaps, to remoteness from the *sea*.

Whenever the lightning appears to linger in the North at eventide, rain almost invariably follows speedily; not so in South.



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Farm situated twenty-five miles above Nashville; surface undulating, abounding in lime-stone. Hemp and corn do well, tobacco also; wheat and cotton inferior; grapes tolerable.

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*From Thomas Meaux, Amelia county, Virginia.*

Lat. 37° 20′ N.; Long. 78° W.

Point of observation about thirty miles W.S.W. from Richmond.

Prevalent winds in spring, summer, and autumn from S.W., rain falling in showers during these seasons. Gusts and tornadoes, with black clouds come from N.W. in late summer; protracted rains in spring and fall come from N.E.

Prevalent winds in winter E. to W. northwardly. Rains and snows in winter from N.E. Lowest observed temperature 6° Fahrenheit, at sunrise, Jan. 29, 1844; highest, 97°, noon, in shade, 20 July, 1844.

These observations made for twenty years.

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*From Willis Fawcett, St. Charles, Missouri.*

Lat. 39° N.; Long. 90° 30′ W.

Wind from any point of the eastern half of the horizon will bring rain generally, after blowing twelve hours. It frequently happens that we have winds in a dry time to blow much longer, even several days, from that direction, without rain; but on the wind's shifting to the opposite side, we are sure of rain. I think our rains during summer come most frequently from the S.E. Wind from the S.W. is generally accompanied by good dry weather. West and N.W. are dry. I have noticed that thunder and lightning in the north is almost invariably followed here by storms of rain and hard wind within twelve or twenty-four hours.

My farm is on an alluvial prairie plain, (probably formed by the washings of the Missouri and Mississippi) six miles below St. Charles.

The apple is our main dependence. Peaches also flourish finely; as do plums, cherries, (except the black,) strawberries, gooseberries, wild and cultivated. Wheat and corn are the principal productions. Timothy hay will soon be exported from our neighborhood to a considerable extent. I cultivate wheat and corn almost exclusively.

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Thus showing, as far as this evidence goes, that the S.W. winds—the winds suggested by the charts—are, except in Western Missouri, the rainy winds. These winds, like those between the same parallels upon the ocean, are going from a higher to a cooler temperature; and these winds in the Mississippi valley not being in contact with the ocean, or with any other evaporating surface to supply them with moisture, must bring the moisture with them from some sea or another.

Therefore though it may be urged, in as much as the winds which brought the Patagonian rains came direct from the sea, that they therefore took up their vapors as they came along; yet it could not be so urged in this case; and if these winds could pass with their vapors from the equatorial calms through the upper

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regions of the atmosphere to the calms of Cancer, and then as surface winds into the Mississippi valley, it was not perceived why the Patagonian rain winds should not bring their moisture by a similar route. These last are from the N. W., from warmer to colder latitudes; therefore being once charged with vapors they must precipitate as they go, and take up less moisture than they deposit.

This was circumstantial evidence. No fact had yet been elicited to prove that the course of atmospherical circulation suggested by my investigations is the actual course in nature. It is a case in which I could yet hope for nothing more direct than such conclusions as might legitimately flow from circumstantial evidence.

My friend Lieut. De Haven was about to sail in command of the American Expedition in search of Sir John Franklin. Infusoria are sometimes found in sea-dust, rain-drops, hail-stones or snow-flakes; and if by any chance it should so turn out that the *locus* of any of the microscopic infusoria which might be found descending with the precipitation of the Arctic regions should be identified as belonging to the regions of the S. E. trade winds, we should thus add somewhat to the strength of the very slender clue by which we were seeking to enter into the chambers of the wind and to "tell whence it cometh and whither it goeth."

It is not for man to follow the "wind in his circuits," and all that could be hoped, was after a close examination of all the facts and circumstances which these charts have placed within my reach, to point out that course which seemed to be most in accordance with them, and then having established a probability or even a possibility as to the true course of atmospheric circulation, to make it known and leave it for future investigations to confirm or set aside.

It was at this stage of the matter* that my friend Baron von Gerolt, the Prussian Minister, had the kindness to place in my hand Ehrenbergh's work, "Passat—Staub und Blut—Regen."

Here I found the clue† which I hoped, almost against hope, De Haven would place in my hands.

That celebrated microscopist reports that he found South American infusoria in the blood-rains, and sea-dust of the Cape Verd Islands,—Lyons, Genoa, and other places.‡

Thus confirming as far as such evidence can, the indications of the "Wind and Current Charts," and increasing the probability that the general course of atmospherical circulation is in conformity with the suggestions of the charts as I had interpreted them, viz: that the trade winds of the Southern hemisphere after arriving at the belt of equatorial calms ascend and continue in their course towards the calms of Cancer as an upper current from the S. W., and that after passing this zone of calms, they are felt on the surface as the prevailing S. W. winds of the extra-tropical parts of our hemisphere; and that for the most part they bring their moisture with them from the trade wind regions of the opposite hemisphere.

Continuing on towards the North pole from the S. W. they enter the Arctic regions on a spiral curve, continually lessening the gyrations until, whirling about in a *direction contrary to the hands of a watch*, this air ascends and commences its return as an upper current towards the calms of Cancer.

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* See my letter to him, paper F.; also, paper read by me before the American Association at its meeting in Charleston, March, 1850.

† *Vide* paper F.

‡ *Vide* paper G, "Passat—Staub, etc." p.—

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It returns to this zone from the opposite direction, N. E., by which it approached the pole.

The atmosphere in this part of the circuit is moving in the direction called $s'$ in a previous part of this paper.

Arrived at the calms of Cancer, $s'$ meets $\delta''$ in the upper regions of the atmosphere.

They both descend—and the fact that the barometer stands higher here* than upon any other parallel, shows that here there is an increased atmospheric pressure, caused in part by accumulation produced by the opposing forces of $s'$ and $\delta''$ ; and in part by the downward currents.

Having descended, $s'$ is forced out on the equatorial side of the zone and appears on the surface as $\Delta$ — the N. E. trade winds—and so continues until it reaches the belt of equatorial calms.

Here then is precipitation, an ascent of atmosphere, and a fall of the barometer : $\Delta$ now becomes $\delta$ or an upper current flowing in a S. E. direction—i. e. from N. W. towards the zone of the calms of Capricorn. Here it is met by the upper current from the Antarctic regions, descends with a rise in the barometer again, and appears on the polar side of this zone of calms, as $\Delta'$—the prevailing N. W. surface winds in the extra-tropical regions of the Southern hemisphere.

$\Delta'$ now approaches the Antarctic regions in a *spiral, gyrating with* the hands of a watch and contracting its convolutions as it draws nearer and nearer the pole, where theoretically there is another atmospherical node in which $\Delta'$ ascends with a low barometer, and commences its return towards the equator as $\delta'$ in the upper regions of the atmosphere.

The same cause—diurnal rotation—which made the $\Delta'$ on the surface to approach from the N.W., now operates to make it return as $\delta'$ in the direction whence it came.

Arriving in the upper regions at the calm zone of Capricorn $\delta$ meets $\delta'$; the two descend, and $\delta'$ continues to flow in towards the equator as $\Delta'$, the S. E. trade wind.

Arrived at the zone of equatorial calms, it ascends, and continues thence in the upper regions of the atmosphere as $\delta'$, until it reaches the calm zone of Cancer. Here it descends, and continues on as the S.W. passage winds of the Northern hemisphere, whose circuit has been already described.

Thus, at the risk of repetition and of being thought tedious, I have described the progress which the Wind and Current Charts had enabled me to make in the theory of atmospherical circulation'; and I have presented that theory as far as it had been developed in my own mind, when I received yesterday No. 1, vol. i, 4th series, of the London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, containing a synopsis of Dr. Faraday's "Experimental Researches in Electricity," 24th, 25th, 26th, and 27th series ; and also the letter of Prof. Von Feilitzsch on the *Physical distinction of Magnetic and Diamagnetic Bodies.*

This account, though meagre, is the first account that I have seen of the Doctor's discoveries relative to the magnetism of the atmosphere.

A new era in our knowledge of the laws and the agents concerned in the general system of atmospherical circulation will probably be dated from these discoveries.

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* Humboldt.

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With the accounts of them before me, I feel somewhat in the condition of the tempest-tossed mariner who has been buffeting with the waves in storm, clouds, and darkness, until he feels himself almost bewildered and lost in the mist that surrounds him; when suddenly a light appears, and, like the grateful mariner, I wished, before taking a fresh departure, to bring up my reckoning, and to ascertain how far I was out, in order to show how great was the service rendered by the sympathising hand which put forth that light.

Dr. Faraday has shown that, as the temperature of oxygen is raised, its paramagnetic force diminishes, being resumed as the temperature falls again.

"These properties it carries into the atmosphere, so that the latter is, in reality, a magnetic medium, ever "varying, from the influence of natural circumstances, in its magnetic power. If a mass of air be cooled, it "becomes more paramagnetic; if heated, it becomes less paramagnetic, (or diamagnetic,) as compared with "the air in a mean, or normal condition."*

Now, is it not more than probable that here we have in the magnetism of the atmosphere that agent which guides the air from the South through the calms of Capricorn, of the equator, and of Cancer, and conducts it into the North; that agent which causes the atmosphere with its vapors and infusoria to flow above the clouds from one hemisphere into the other, and whose foot-prints had become so palpable?

With the lights which these discoveries cast, we see why that air which has completed its circuit to the whirl† about the Antarctic regions should then, according to the laws of magnetism, be repelled from the South, and attracted by the opposite pole towards the North.

And when the S. E. and the N. E. trade winds meet in the equatorial calms of the Pacific, would not these magnetic forces be sufficient to determine the course of each current:—bringing the former with its vapors of the Southern hemisphere over into this by the courses already suggested?

This force, and the heat of the sun, would propel it to the north. The diurnal rotation of the earth propels it to the east; consequently its course first through the upper regions of the atmosphere, and then on the surface of the earth, after being conducted by this newly-discovered agent across the calms of Cancer, would be from the southward and westward to the northward and eastward.

These are the winds which, on their way to the North, from the South Pacific, would pass over the Mississippi valley, and they appear to be the rain winds there. Whence then, if not from the trade-wind regions of the South Pacific, can the vapors for those rains come?

According to this conjecture, and not taking into account any exceptions produced by the land and other circumstances upon the general circulation of the atmosphere over the ocean, the S. E. trade winds which reach the shores of Brazil near the parallel of Rio, and which blow thence for the most part over the land, should be the winds which, in the general course of circulation, would be carried towards northern Africa, Spain, and the south of Europe.

They might carry with them the infusoria of Ehrenberg, but, according to this theory, they would be

* Phil. Mag. and Journal of Science, 4th Series, No. 1, January, 1851, page 73.

† "It whirleth about continually."—*Bible*



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wanting in moisture. Now, those portions of the old world are for the most part dry countries, receiving but a small amount of precipitation.

Hence the general rule: those countries to the north of the calms of Cancer which have large bodies of land situated to the southward and westward of them in the S.E. trade-wind region of the earth should have a scanty supply of rain, and *vice versa.*

Now, the extra-tropical part of New Holland comprises a portion of land thus situated in the Southern hemisphere. Tropical India is in its N. E. trade-wind region, and should give it a slender supply of rain. But what modifications the monsoons of the Indian ocean may make to this rule, or what effect they may have upon the rains in New Holland, my investigations in that part of the ocean have not been carried far enough for a decision.

Taking up the theory of Ampére with regard to the magnetic polarity induced by an electrical current, according as it passes through wire coiled *with* or coiled *against* the sun, and expanding it in conformity with the discoveries of Faraday, we perceive a series of facts and principles which, being applied to the circulation of the atmosphere, make the conclusions to which the charts have led me touching the continual "whirl" of the wind in the Arctic regions *against*, and in the Antarctic *with the hands of a watch*, very significant—much more so than I had supposed them to be.

In this view of the subject we see light springing up from various sources, by which the shadows of approaching confirmation are clearly perceived. One such source of light have we from the university of Greifswald, in Prussia.

Likening the atmosphere with its magnetic spirals of oxygen to the coils of a wire, and the poles of the earth as the ends of the helix used by Professor Von Feilitzsch, we might almost fancy that he was experimenting expressly with the view of throwing light upon the general course of atmospherical circulation.

"If," says he in his letter to Dr. Faraday, "we observe two such neighboring particles near the external "south pole, then will the more near repel a south pole with the intensity $s$; the more distant will turn to a "north pole with the intensity $n'$, but in such a manner that $n' < s$. But outwardly these two excited mag- "netisms act with the difference of their power $s - n'$; but this is in one case *south polar*, consequently of the "same kind as the exciting south pole. The contrary will take place near the north pole, so that the "*disengaged magnetism distributed over the bar becomes south polar on that half which is turned to the south "pole, but north polar on the other half that is turned to the north pole.* A substance where this takes place "is *diamagnetic*, it places itself equatorial.

"When the bar of a magnetic substance is so qualified that the separating action of the molecules on "each other must be taken into consideration, then it can become so strong that the molecules in the middle "of the substance are more strongly magnetic than towards the ends. If we observe once more two such "particles near two such particles near the external South pole, the South pole of the nearest will tend to recede "by an intensity $\frac{s}{1}$ from this external South pole, but the more distant will turn towards it a North pole of the "intensity $n'_1$ but in such a manner that $n'_1 < \frac{s}{1}$. Outwardly the two will act with the intensity $n' \frac{s}{1} - \frac{s}{1}$. but this

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" is North polar, therefore of a contrary nature to the exciting South pole. The contrary will take place near " the pole so that the *disengaged magnetism distributed over the bar becomes North polar on the half that is* " *turned to the South pole, but South polar on that half which is turned towards the North pole.* A substance " where this takes place is *magnetic*, it places itself *axial*."*

" Applying the former to the theory of Ampére, I was startled because it has hitherto taught only that " currents which are parallel and directed in the same way attract, but if they are parallel and not directed in " the same manner they are repulsive; therefore, that a current moving in the direction of the hand of a watch, " in a spiral produces a South pole on the entrance point in the spiral, but a North pole on the egression point. " Hitherto only such spirals have been constructed in which the current in every winding shows an equal " intensity."

" But I tried to arrange spirals of the following kind:—one of them is in such a way constructed that " on two copper wires are soldered to each of them, fifteen thin wires covered over with silk. The first wind- " ing backwards over the copper wire, i. e. the first convolution of the helices, beginning at the end and pro- " ceeding towards the centre is with all the fifteen wires, the second winding is only wound with 14 threads, " whilst the fifteenth is carried along the axis, &c.; consequently every convolution of the fifteen windings " has a thread less, and the ends of all the other threads have direction of the axis. The ends of the fifteen " threads are soldered in the middle, and the two thick wires without touching each other, are so bent that " they can be suspended in the little cups of the apparatus of Ampére, then a current passing through the " spiral will divide itself in such a manner that it is most strong on the external ends of the spiral but decreases " more and more to the middle. If the windings of the spiral took place in the direction of the hand of a watch, " then the end of it where the current enters will become a South pole, but a *North pole* kept parallel to the " spiral *will repel it*, only the final convolution will be attracted, and it represents the disengaged magnetism " of the final surface."

" A second spiral is wound like that described only with this difference that the strongest convolutions are " in the middle, and the feeblest near the ends. This spiral will be attracted by the North pole of a magnet " over the half in which the current moves at first or enters, but the other half will be repulsed by it. The " third spiral has the winding the same strength over the whole extent; it is indifferent to a magnet pole which " is not too near and only the final convolutions are attracted or repulsed."

" Therefore it is permitted to enlarge the theory of Ampére in this manner:—

" — If an electric current passes through a spiral in the direction of the hand of a watch and,

" *a* If the current is more feeble in every winding as it is nearer to the centre of the spiral, then that half is " attracted by a South pole in which the current enters except the first winding.

" *b* But if the current is stronger in every winding as it is nearer to the centre of the spiral than that " half is repulsed by a South pole in which the current enters including the first winding.

* Page 48.

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"The contrary will be the case for that half in which the current leaves the helix and likewise for the "North pole of the magnet opposed."*

Attentively considering the experiments of the Professor of Greifswald, we may trace an analogy between his spirals and the spirals which the currents of the wind in "his circuits" describe about the earth. At the South polar calms, the atmospherical spiral is with the hand of the watch, and as in the case of a spiral so wound about its helix the magnetism is South polar; and so *mutatis mutandis* for the regions of North polar calms.

May we not look therefore to find about the North and South magnetic poles these atmospherical nodes or calm regions, which I have theoretically pointed out there? In other words, are not the magnetic poles of the earth in those atmospherical nodes, the two standing in the relation of cause and effect, the one to the other?

And have we not a clue already placed in our hands by which the motion of the circular storms of the Northern hemisphere which travel *against*, and those of the Southern which travel *with* the hands of a watch, seems to be connected with the like motion of the wind of each hemisphere in its circuit about its pole? and will not this clue when followed up lead us into the labyrinths of atmospherical magnetism for the solution of the mystery?

Indeed so wide for speculation is the field presented by these discoveries that we may in some respects regard this great globe itself with its "cups" and spiral wires of air, earth and water, as an immense "pile" and helix, which being excited by the natural batteries in the sea and atmosphere of the tropics, excites in turn its oxygen, and imparts to atmospherical matter the properties of magnetism.

Thus, though it be not proved as a mathematical truth that magnetism is the power which guides the storm from right to left, and from left to right, which conducts the moist and the dry air each in its appointed paths, and which regulates the "wind in his circuits," yet, that it is such a power, is rendered so very probable that the onus is now shifted, and it remains not to prove, but to disprove that such is its agency.

Respectfully &c.,

M F. MAURY,

*Lieut. U. S. N.*

HON. W. A. GRAHAM,

*Secretary of the Navy.*

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* Page 49, 50, Phil. Mag.

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# A.

*Programme of the Instructions issued to Lieut. Commanding J. C. Walsh of the U. S. Schooner "Taney," by the Secretary of the Navy, October 4th, 1849.*

The object of the service upon which the "Taney" has been detailed, is to make observations upon the winds and currents of the sea, and to collect other facts in connection with the "wind and current charts" of Lieut. Maury, and which are of practical importance to the safe navigation of the seas, or to the study of the phenomena of the ocean. This is an important service. It is a service which requires patient and laborious observations from the officers entrusted with it.

A faithful record of every phenomenon observed with a full statement of all the circumstances as to time, place, &c., connected with it, is of great importance.

It is expected therefore, that you and the officers of the "Taney," will bestow upon the duty which has been assigned yourself and them, because of a peculiar fitness therefor, the utmost diligence and the most assiduous attention.

The subjects of observation which will command your particular attention, are:

1st, The force and direction of the wind, the hourly state of the weather and all the meteorological conditions connected therewith, as thermal, dynamical, barometrical and the like.

2d, The force and set of currents, their depth and width, their temperature and the position of their edges or limits.

3d, Hourly observations upon the temperature of the surface water.

4th, Frequent observations upon the temperature of the ocean at various depths.

5th, Deep-sea soundings.

6th, Vigias and all dangers about which there are doubts either as to existence or position.

7th, Transparency and saltness, or the specific gravity of sea-water, in the different parts of the ocean.

You will determine the specific gravity of the water either by one of the hydrometers or the specific gravity bottle furnished for the purpose.

You will keep an abstract of your log, as per form. It is believed that the form itself is sufficiently explicit as to what is wanted for the abstract, a copy of which you will send to Lieut. Maury, as often as you have an opportunity, returning the original to him when you arrive in the United States.

You will make it a rule, the better to ascertain rate of currents and fix their limits, to determine by observation the variation of the compass and your position in the forenoon, in the afternoon and at night, as well as at noon whenever the weather will permit; and after allowing for lee-way, heave of the sea, variation of the compass and false steerage, you will call the difference between the place of the vessel as established by observation, and as established by *dead reckoning*, current, and so enter it in the abstract.

You will also try in calms and as often as convenient, both for surface and under currents, in the usual way, by lowering boats, letting down weights, &c.



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For longitude by chronometer at night, the planets or the largest of the fixed stars are the best objects to be observed when the horizon is good—The Mer. Alt. of the moon may be used for latitude at night or in the fore or afternoon according to its age.

Note in its proper column, not only the portion of cloudy sky, 10 being entirely overcast, and 0 clear; but state also the direction or directions in which the clouds are moving, with the kinds of clouds, as Nimb., Cum., Cirrus, Stratus, &c.

In taking temperature of surface water, a fresh bucket should be drawn up each time, the thermometer plunged into it immediately, held there for several minutes, and *read while the bulb is in the water.*

For the purpose of ascertaining the existence of under currents, you will sound at intervals, at the least, of every 30 miles, with 100 fathoms line, if there be as much depth, attaching to the line two thermometers, one near the lead and the other 50 fathoms from it. In case you have no thermometers suitable, or should lose them, then you will attach two hollow non-conducting cylinders with valves opening upward, in the place of the thermometers, haul the line up briskly and try quickly the temperature of the water brought up in the cylinders.

In case you should find an under current, you will endeavor to ascertain its limits and set with all the accuracy possible. For rate and direction, a block of wood, or a barrega loaded just to sinking, and suspended at any required depth by a small float just sufficient to keep it from sinking further, will perhaps be the best means.

The determination of the rate and set of under currents is an operation which is so modified by the weather and other circumstances, that it must of necessity be left, in a great measure to the judgment and mental resources of the operators. The officers of the "Taney" will perhaps have abundant opportunity to display their ingenuity with regard to the subject. The lead used in sounding for temperatures should be painted white, and the distance at which it disappears going down and reappears coming up should be entered in fathoms in the transparency column.

The "Taney" will be provided with the means of sounding at great depths. It is desirable to reach the bottom at every attempt, for the depth of the ocean is an important element towards a perfect understanding of the tides, their laws of motion, the course and form of the tidal wave and the like.

At the distance of every two hundred miles across the ocean, soundings must be made all the way both going and returning with the view to reach the bottom and determine the depth of the sea. The "Taney" has been provided with the necessary apparatus therefor. In each case the lead must be armed, the specimens of the bottom which it may bring up must be preserved in a bottle with a label attached showing the date, place and the depth. The time selected for these soundings should be calm weather, when the sea is smooth and when there is a likelihood of its so continuing for several hours at least. In hauling up the sounding line from great depths, care should be taken to prevent the lead from having too great an upward motion, lest by turning around it should twist the line in two. Therefore in hauling it up frequent pauses should be made to allow the line to untwist. It is desirable also to have specimens of water from the gratest depths.

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In going across the Atlantic and in looking after the vigias and doubtful dangers to which your attention will also be called, it will be most convenient for you to take up your position for deep sea-soundings in the calm region known as the "horse latitudes," which in the month of October will be found between the parallels of 24° and 35° N. according to longitude; you will see the limits of this calm belt sufficiently marked and developed on series B, of Maury's wind and current chart, with copies of which the "Taney" will be supplied.

A series of accurate barometrical observations in this belt of calms will be of exceeding interest and value. It is one of the nodes in the general system of the atmospherical circulation of the earth. Here the winds from the polar meet in the upper regions, those from the equatorial calms, and they so nearly balance each other as to produce almost a perpetual calm. We may then look under this meeting of opposing winds for an accumulation of atmosphere, and consequently for an increased barometrical pressure, and from this increase of pressure accurately determined, may be derived an expression to show the total amount or value of those physical forces which are exerted to put and keep the trade winds in motion. You will therefore be diligent with the barometer in those regions and in all others, taking care when it is mounted on board to note in the abstract log its distance from the level of the sea.

The "vigias" and dangers of doubtful existence or position which you will look after are Ashton's Rock about latitude 35° 50′ N., longitude 71° 48′ W., said to be 8 feet above the water, and to have been seen in 1824. False Bermudas about latitude 32° 37′ N., longitude 58° 37′ W. They are rocks, said to be frequently mistaken for the Bermudas, they are laid down in a part of the ocean but little frequented.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Nye's Rock - - - - | 31° | 15′ | N. Lat. | Long. | 55° | 41′ | W. |
| Van Kuelen's Vigia, - - - | 31 | 40 | " | " | 38 | 10 | " |
| Josyna Rock, - - - - | 31 | 45 | " | " | 23 | 20 | " |
| Steen's Ground, - - - | 32 | 30 | " | " | 21 | 15 | " |

You will touch at one of the Canaries for water. Without unnecessary delay, you will proceed thence towards the Cape Verds, examining as you go the position of Maw's Rock, Bon Felix Shoal, the Bonetta Rocks, and the reef to the west of them, marked on Maury's chart as doubtful with regard to position.

The route, so far as it has been indicated to you, will take you through the Sargasso Sea. You will be careful to try the depth, and the temperature of the water of that sea, and to note the latitude and longitude of its edges where you cross it.

Besides the regular series of deep-sea soundings, you are requested to make frequent use of the lead (deep-sea) in the vicinity of all "vigias" and "rocks" that are supposed to lie in your way; for if they exist, you will probably find shoaler water in their vicinity.

After completing this service, you will put into Port Praya for water and provisions. Filling up with these, and allowing your crew and officers a few days to refresh, you will again put to sea; standing to the southward, and examining as you go Warley's Shoal and French Shoal of 1796; the supposed place of both of which are marked on the charts of Lieut. Maury.

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From the last-named shoal you will proceed to a supposed submarine volcanic region of considerable extent between the Equator and 3° south latitude, and between 15° and 25° west longitude. Through all parts of the ocean you will continue as you go, the regular series of observations as to winds, currents, temperatures, soundings, &c., as per form of Abstract Log.

In passing the region of equatorial calms, you will again cross one of those atmospherical nodes under which nice barometrical observations become of exceeding interest.

After having satisfied yourself as to the characteristics with regard to depth and bottom in that part of the ocean just alluded to as probably volcanic, you will proceed to make Cape St. Roque, bestowing unremitted attention to the soundings and temperatures as you go.

There seem to be reasons to suppose that an under-current of warm water has its genesis in this part of the ocean; soundings in deep-sea temperatures across the Southern Atlantic may throw some light upon this important question.

Arriving off Cape St. Roque, and having put into some convenient port of Brazil for water, if necessary, you will proceed to make a zig-zag course along the coast to the northward, for the purpose of investigating the currents thence to the mouth of the Amazon. You will make stretches off from the coast of one hundred miles, or as far as it may be necessary, in order to cross and define the system of currents and counter-currents that are supposed to prevail there, and a correct knowledge of which is so essential to the speedy and safe navigation of that part of the ocean.

Having satisfied yourself as to those currents, you will proceed homeward by the following route:—from the Equator in long. 37° W., draw a straight line to Cape Charles. This line will lay nearly in the middle of a strip of the ocean about 300 miles broad, and which is remarkable for the temperature of its water. You will sail a zig-zag course through this strip, crossing it at least four times on your way home, and passing the line which you are directed to draw, at least two hundred miles on either side, and taking deep-sea soundings before you put about to recross it again. Should you discover anything remarkable as to the depth of the sea within this region, you will push the discovery to a conclusion.

It is expected that you will return to the United States some time in the month of April next.

As the service on which you are engaged has for its object the making of observations and the collecting of facts *at sea*, you will keep the sea during your absence as long as practicable.

It is not expected that you will at all times be able to carry on without interruption the series of observations as here laid down for you. It is supposed that they will be interrupted from time to time by the weather and other circumstances. Much, therefore, must be left to your discretion; you understand the nature of the service which is required, and are in possession of the views of the Department on the subject. The Department therefore commits the service to you, feeling assured that you will in all cases exercise a sound discretion, and so meet its just expectations.

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# B.

*Lieutenant J. C. Walsh to Lieutenant Maury.*

BORDENTOWN, NEW JERSEY, *August 15th*, 1850.

SIR,—I have to add to the "Abstract Log" of the U. S. Schooner Taney, which has been sent you, some remarks upon the results of parts of our work there recorded: the explorations in the Atlantic, for some of the many rocks and vigias of doubtful existence,—deep soundings with the wire,—investigations of currents, particularly the under currents, &c.

The *rocks and vigias* searched for, with the positions assigned to them upon the Charts, are as follows:

| | | |
|---|---|---|
| Ashton Rock . . . . | Lat. 33°50′ N. | Long. 71°40′ W. |
| False Bermudas . . . . | " 32 30 | " 21 15 |
| Nye's Rock . . . . | " 31 15 | " 55 50 |
| Vankeulen's Vigia . . . | " 31 40 | " 38 20 |
| Josyna Rock . . . . | " 31 40 | " 23 45 |
| Steen Ground . . . . | " 32 30 | " 21 15 |
| Mary's Rock . . . . | " 19 42 | " 20 45 |

Not one of them was found, nor any indication of their existence; on the contrary, every evidence to disprove it. Our various tracks over and about their reported positions, covering the extent of 1½ degrees of longitude and 40 miles of latitude, with the many and deep soundings, from 100 to 800 fathoms, without getting bottom, will be found sufficient, I trust, to satisfy navigators that they have no existence,—or at least, that those parts of the ocean in which they have been reported to exist, are free from all dangers. To the first three mentioned, we gave the most thorough search: to Ashton Rock, six days time; to the False Bermudas, eight days; to Nye's Rock, likewise eight days. All our tracks were by daylight, as the schooner was always hove to at night while engaged in these explorations. A slight discoloration of water was noticed in the region assigned to Mary's Rock, but no soundings could be got with 500 fathoms. This rock had been previously searched for with like results, by the U. S. Exploring Expedition, Captain Wilkes; and by H. M. S. Levin, Captain Bartholomew. Ashton Rock is placed in a most frequented part of the ocean; there is not a day that some vessel does not pass in the vicinity, and nothing has been seen of it since the first and only report of it in the year 1824. This fact alone should disprove it, independent of our search. I find Mr. Blunt has erased it from his Chart of the North Atlantic, as also the False Bermudas, Vankeulen's Vigia, Steen Ground and Mary's Rock. There are sufficient real dangers in the Atlantic; these imaginary ones should not disfigure the charts; they only serve to harass navigators, turn vessels from their routes, and thus injure commerce. The reports of them by merchant vessels, which seldom take time to examine the appearances of such dangers, can be readily explained. Floating wrecks, large trees, carcasses of whales, &c., presenting all the appearance of reefs, have deceived experienced seamen.

Though we did so much less in *deep soundings* in the Atlantic, than expected, owing to the rough weather,



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bad state of the vessel and loss of so much wire, in the first experiment, nevertheless, the proving the ocean to have a depth of more than 5,700 fathoms, (34,200 feet, or more than six statute miles,) as was satisfactorily done in this first trial, is alone of much interest and importance. This vast depth, greater than the elevation of any mountain above the surface, and the greatest depth of the ocean ever yet measured, was reached without finding bottom, in latitude 31° 59′ N., longitude 58° 43′ W., on November 15th, 1849. The wire broke at this length, 5,700 fathoms, at the reel, and this large portion of our supply was thus so early lost. It preserved the exact plumb line throughout the sounding; there was a steady, uniform increase of weight and tension; no check whatever any instant of its descent,—which prove that it could not have touched bottom before the break.* It had been very carefully measured and marked, so that the *ocean here is deeper than* 5,700 *fathoms*, can be relied upon as accurate. This great sounding is within 32 miles of the assigned position of the rocks, called the False Bermudas, for which we were then in search, which fact alone should go far to disprove them. We had three choice chronometers, two of which performed with rare excellence throughout the cruise, and being a beautiful, clear day, a number of sets of observations were taken in the morning, noon, and afternoon, so that the position was determined with the nicest accuracy. It proved the finest possible day for this work, the sea so smooth, and hardly a breath of wind. Though we found by trial in the morning a slight surface drift, setting to W. S. W., there was no change of position during the sounding, as proved by the observations; the great weight and extent of the wire, penetrating to such profound depths, seemed to serve as an anchor to keep the little schooner steady.

In all our subsequent work under this head, I found the heave of the sea, however slight, was the great difficulty—the lifting of the stern in the pitching motion causing such an immense increase of strain upon the

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* The lead used was but 10 lbs. weight, with a Stellwagen cone fitted to it. Nothing else was attached to the wire but a small instrument (weighing about 6 lbs.) invented by yourself, for indicating the depth reached: I had tested this several times to considerable depths, and found its indications correct. Our arrangements for these deep soundings were altogether very complete. It may be well to add an account of them. We had on board 14,300 fathoms wire, weighing 3,025 lbs., all of the best English steel, of five different sizes, Nos. 5, 7, 8, 10, and 13 (Birmingham gauges.) Every part was tested to bear at least one-third more than the weight which it was calculated to sustain.

An extent of 7,000 fathoms of this, weighing 1,800 lbs. (the remaining 7,300 fathoms, composed of the smaller sizes, Nos. 10 and 13, being stowed away as spare wire,) carefully measured and marked with small copper labels, was linked into one piece, and wound upon an iron cylinder, 3 feet in length and 20 inches in diameter,—the largest-sized wire being wound first, so as to be uppermost in sounding. Two swivels were placed near the lead, and one at each thousand fathoms, to meet the danger of twisting off by the probable rotary motion in reeling up. The cylinder with the wire was fitted to a strong wooden frame, and machinery attached—fly-wheel and pinions, to give power in reeling up. Four men at the cranks could reel up with ease, with the whole weight of wire out. Iron friction bands, which proved of indispensable importance, were connected to regulate the rate of the wire in running off the reel. One man with his hand upon the lever of one of these friction bands could preserve a uniform, safe velocity, checking or stopping the wire as required. The whole apparatus could be taken apart and stowed away in pieces (being so large and massive, this was indispensable in so small a vessel as the Taney.) When wanted for use, the frame was put together and secured to the deck by iron clamps and bolts, near amidships, the reel hoisted up from below and shipped in its place; a *fairleader* was secured to the taffrail, being a thick oak plank, rigged out five feet over the stern, having an iron pulley, 18 inches diameter, fitted in its outer end, and two sheet iron fenders 3½ feet long, of semi-circular shape, fitted under it, to guard the iron wire from getting a short nip in the drifting of the vessel. The wire was led aft, from the reel, over the pulley which traversed freely in the fairleader, and passed between these fenders into the water.

The time occupied in the descent of *the* 5,700 *fathoms*, at the moderate rate it was allowed to go off the reel, using the friction bands, was exactly 1½ hours. I found in the subsequent soundings, that two or three men could reel up 1,000 fathoms in 2½ hours, taking time to rub dry and oil it in passing to the reel, to guard against rust.

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wire, breaking it upon almost every occasion on reaching about 2,000 fathoms. It is under the most favorable circumstances, when the sea is very unusually smooth, that this mode of measuring its vast central depths can succeed.

The next subject to which I would refer, is our investigations of the *under-currents* of the ocean. I regret we had so few opportunities for these very interesting experiments; but enough has been done to seem to warrant the conclusion, that these under currents are *generally* stronger, setting in various different directions, than those of the surface. I am well aware that there is no mode of testing their *exact* velocity; but that practised by myself, which I will describe, was certainly all-sufficient to show their relative velocity. There may be none so rapid as that mighty oceanic river, the *Gulf Stream:* unfortunately, the weather prevented our making these investigations in that interesting region; but in the various parts of the Atlantic in which we succeeded in these experiments, on only two occasions did we find the under-current of less velocity than that running in a different direction above it. The following is the mode practised in testing them:

The surface-current was first tried by the usual mode (a heavy iron kettle being lowered from a boat to the depth of 80 fathoms); then, for the trial of the under current, a large *chip-log*, of the usual quadrantal form, the arc of it measuring full four feet, and heavily loaded with lead to make it sink and keep upright, was lowered by a light but strong cod-line to the depth of 126 fathoms, (the length of the line;) a barrega was attached as a float, a log-line fastened to this barrega, and the rate of motion of this float, as measured by this log-line and the glass, as well as the direction as shown by a compass, were assumed as the velocity and set of the under current. No allowance was made for the drag of the barrega, which was always in a different direction from the surface current. It was wonderful, indeed, to see this barrega move off against wind, and sea and surface current, at the rate of over one knot an hour, as was generally the case, and on one occasion as much as 1¾ knots. The men in the boat could not repress exclamations of surprise, for it really appeared as if some monster of the deep had hold of the weight below and was walking off with it. I will cite from the Log several instances of these experiments:

On May 11th, in lat. 24°43′ N., long. 65° 25′ W., we found a surface current of one-third knot per hour setting to the West, and an under current, at the depth of 126 fathoms, of one knot, setting W. S. W.—temperature of water at surface 77.3°, at 50 fathoms 77.5°, at 100 fathoms 73.5°. The current felt by the vessel on that day (as deduced from the comparison of the true positions obtained by astronomical observations and chronometers, with those by the dead-reckoning) agreed with this trial of the surface current, being the same within a fraction, viz: 0.3 knot, westerly. On this day, as noted in the "Column of Remarks," the sea was covered by a species of *medusæ*, of a dark-red color, spherical in shape, from one-eighth to three-eighths inch in diameter.

On May 12, at 4 P. M., in lat. 25° 55′ N., long. 64° 43′ W., the surface current was found to be ¼ knot, setting N. N. E., and the under current (at 126 fathoms) 1¾ knots, setting S. E., being the strong under current I have alluded to: this was well ascertained by several trials—temperature of water at surface 75°, at

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50 fathoms 76°, at 100 fathoms 69°. From this time, 4 P. M. to 8 A. M., the following morning, we experienced a strong current of 1.3 knots per hour, setting N. 14° E., as determined by the observations. While trying the currents in the boat, all hands remaining on board the schooner were employed sounding with 500 fathoms line, but failed to get the temperature at that depth, there being at the time too much swell.

On May 13th, at 5*h*. 30*m*. P. M., in lat. 26° 42′ N., long. 64° 4′ W., the surface current was found to be ½ knot setting E. by S., the under current (at 126 fathoms) 1½ knots setting W. S. W.; at same time obtained the following temperatures: at surface 77.5°, at 50 fathoms 76.5°, at 100 fathoms 74.5°, at 500 fathoms 53°. The current felt by the schooner in the interval from 8 A. M. to 4 P. M. was easterly 0.4 knot per hour, agreeing with the trial in the boat.

On May 14th, in lat. 26° 46′ N., long. 63° 53′ W., found a slight surface drift, too small to be measured, setting to the westward, and an under current (at 126 fathoms) of 1¼ knots, setting N. by E. No current had acted on the vessel for the preceding 16 hours, the dead reckoning agreeing with the observations.

On this day, the sea being pretty smooth, we tried soundings with the wire, and got 1,050 fathoms without bottom, and we succeeded in getting, by one of the Syx's self-registering thermometers, (which came up uninjured by the immense pressure), the temperature at that great depth, which was 49°, while at the surface it was 77°.

On 18th May, at 9 A. M., in latitude 36° 6′ North, longitude 67° 56′ West, found a surface current of one-third knot, setting N. W. by N., and a very slight under current (at 126 fathoms) not more than one-sixth knot setting N. E. No current was felt by the vessel during that day, but during the preceding night one-fourth knot per hour, setting N. W. Being calm and pretty smooth, we sounded during this day to the depth of 2,050 fathoms, when the wire broke without reaching bottom. The temperature at surface 70°, at 100 fathoms 65°. The trial of currents on this day was one of the two occasions which I have alluded to, on which we found a less under current than that above it.

On 29th May, at 11 A. M., in latitude 33° 58′ N., longitude 72° W., found the surface current one-third knot, setting S. E., and an under current (at 126 fathoms) of one knot setting W. N. W.; temperature at surface 71°, at 50 fathoms 70.5°, at 100 fathoms 67°. We were set during this day, as determined by the afternoon observations, to the eastward, at the rate of one-half knot per hour. On this, which happened to be the last occasion of these experiments, I tried the current at the depth to which the kettle was lowered (80 fathoms) which it would have been better to have always done; I found it tended in the same direction as that at 126 fathoms, (counter to the surface current,) but at so small a rate that it could hardly be measured, not more than $\frac{1}{10}$ knot per hour, the float moving at only this small rate, being but one-tenth of the velocity at which it had moved just before when trying at 126 fathoms. This indicates that the kettle had just penetrated the under current; and thus, by this means, it would appear practicable to measure the depth of the surface current, or its point of contact with the counter under current. Such experiments in the *Gulf Stream* would be particularly interesting.

In connection with this subject of under-currents, or *submarine streams*, I may hope that you will find our

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record of the temperature of the ocean, taken, according to instructions, at every 30 miles, to the depths of 100 and of 50 fathoms, and the surface temperatures taken every hour, may serve to throw more light in this new world of research, of such great interest and importance in terrestrial physics.

The column of currents, in the abstract log, gives the currents of practical importance to navigation, those of the *surface* for every eight hours, or as often as ascertained by the observations; the difference between the true position, as determined by them, and that deduced from the log or dead-reckoning, being held as the effect of current. Our dead-reckoning was with this view kept with unusual care and nicety. I found the night observations could not be depended upon sufficiently to determine currents, but the early morning or evening twilight often afforded beautiful opportunities—the horizon so well defined, and the larger planets and stars so clear and brilliant. You will notice we met with the usual variable currents in crossing the North Atlantic in about latitude 31°, region of variable winds: between the longitudes, however, of 48° and 57° we met with a steady current of about one knot an hour, setting to northward and westward. Recrossing, in about latitude 17°, we experienced daily the great *Equatorial stream* setting to the westward, at the average of half a knot per hour. This is within the region of the *Trade Winds*—and here we often noticed the upper light clouds, the *cirri*, moving from the westward, while the lower strata moved with the prevailing winds from the eastward, thus indicating the existence of an upper current of winds counter to the *Trades*.

We first crossed the *Gulf Stream* on the 31st October; we struck into it in latitude 37° 22′ N., longitude 71° 26′ W., as indicated by the temperatures of the water, which were as follows:

| | | | | | |
|---|---|---|---|---|---|
| 8 | A. M. | water at surface | 66°, | air | 54° |
| 9 | " | " | " | 73°, " | 53° |
| 10 | " | " | " | 76°, " | 55° |
| 11 | " | " | " | 77°, " | 56° |

Making a S.S.E. course good at the rate of six knots an hour. 77° was the highest temperature found in the stream in crossing it this time. We were set by it to the eastward at the rate of 3.6 knots per hour. We got out of it, judging from the water getting back to 70°, in latitude 36° 16′ N., longitude 70° 56′ W., bearing from the point of entrance S. 20° E. distant 71 miles. This 71 miles would, therefore, appear the breadth between those points of latitude and longitude; no doubt, however, the surface breadth varies considerably, as also the *velocity*, affected by the winds and other causes unknown. We encountered the usual bad weather, and suffered much in our little craft from a very heavy, irregular, and topling sea, which kept the decks flooded. I extract from the column of "Remarks" on that day: "Oct. 31st—*On western edge of Gulf Stream*—from 4 A. M. to 8 A. M., fresh, with heavy squalls, accompanied by thunder, lightning, *hail*, *snow*, rain and appearances of waterspouts; columns of dense vapor rising from the sea to the clouds," &c. "The same bad weather continued throughout the day. From 8 to midnight, hail with rain, accompanied by squalls and a tremendous sea."

Recrossing this *stream* on our return, on May 30th, we entered it in latitude 35° 30′ N., longitude 72°



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35′ W., having a slight touch of the same weather, "squalls with rain, thunder and lightning." The temperatures stood as follows:

| | Water at surface. | Water at 50 fathoms. | Water at 100 fathoms. | Air. |
|---|---|---|---|---|
| 8 A. M. | 71.8° | 71.8° | 67° | 70° |
| 9 " | 73 | | | |
| 10 " | 75.5 | | | |
| 11 " | 78.5 | | | |
| 12 " | 78.5 | 77.5 | 72.5 | 76 |

79° was the highest temperature found, when at the same time it was 77° at 50 fathoms, and 74° at 100 fathoms. Its velocity, as felt by us in crossing this time, was 2.5 knots per hour, setting N. 77° E. We got out of it in latitude 36° 42′ N., longitude 72° 10′ W., bearing from the point of entrance N. 16° E. distant 78 miles: 78 miles, therefore, appears the breadth between these points of latitude and longitude.

The temperatures, on leaving it, stood as follows, the air being 66°:

3 A. M., water at surface 78°.

4 A. M., water at surface 74°, at 50 fathoms 70°, at 100 fathoms 64°.

5 A. M., water at surface 72°.

6 A. M., water at surface 71°.

Heading during these three hours N. W. by N. at the rate of three-and-a-half knots an hour. At 9 A. M. the water stood at surface 69°.5, at 50 fathoms 65°.5, at 100 fathoms 56°.5. By 1 P. M. the temperature at surface had fallen to 63°.5, at 50 fathoms to 58°.5, at 100 fathoms 58°, the temperature of the air being 68°.

When on sounding next day, June 1st, in latitude 39° N., longitude 70° 30′ W., the water showed as low as 51° at surface, and maintained an average temperature of 53° until we reached New York. This is a difference of 28° from the adjacent Gulf Stream. Shoals of porpoises and black fish were seen by us in the hot waters of the stream. We saw very little Gulf or sea weed (fucus natans) in it, but much at its outer edge. While mentioning this weed I may here remark, that we looked in vain, in the region assigned to the *Sargasso Sea*, for the great fields of it which have been reported. Small patches of five or six feet, generally arranged in long parallel lines in the direction of the wind, were seen daily in crossing the Atlantic till we reached the longitude of 28°, when it disappeared altogether. My frequent examinations of this weed satisfy me that, wherever it may originally come from, it feeds and grows upon the waters of the sea, which is certainly not more strange than the plant which feeds upon the air.

We discovered the *hot waters of the Gulf Stream* extending as far east as 73° 10′, in a latitude so far South as 33° 30′. The column of water temperatures in the "Abstract"* from May 23d to 29th, while engaged in the search for Ashton Rock, will satisfy you of this interesting and important fact; for you will notice that whenever we reached that longitude, in our various tracks between the latitudes 33° 30′ and 34° North, we

* *Vide* paper C.

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experienced a sudden change of as much as 5° and 6° in the surface temperature—70° to 76°. This must be a branch or offset from the Gulf Stream, being so far to the eastward of the limits hitherto given to it *in those latitudes*. We first noticed this extraordinary change of temperature on the 23d—the temperature of surface water rising on that day from 71.5° to 79°. I cite from the Abstract:

Midnight, commencing 23d May, latitude 32° 35′ North, longitude 73° 24′; surface water 71.5°, at 50 fathoms 71.5°, 100 fathoms 67°.

8 A. M., latitude 32° 58′ North, longitude 73° 36′, surface water 73°.

9 A. M., latitude 32° 50′ North, longitude 73° 38′, surface water 75°, at 50 fathoms 73.5°, 100 fathoms 70°.

3 P. M., latitude 33° 03′ North, longitude 73° 52′, surface water 79°.

The current at 8 A. M. was found by trial to be one knot per hour, setting W. N. W., and the undercurrent (at 126 fathoms) one knot, setting to the E.; the current felt by the vessel (as determined by comparison of results of observations and dead reckoning) was 1.5 knots per hour, setting westerly; this was between 8 A. M. and 4 P. M. The variations of temperature of the water, recorded on the next day, (24th of May, in latitude 33° 25′, longitude 72° 40′, are worthy of notice—the sudden fall of 3½ degrees in one hour, from 6 to 7 P. M., 75.5° to 72°, while standing to the northward and eastward, and the rise again the next hour to 75°, made me suspect the possibility of a *shoal*, so that I put back, found the place again, and sounded with 300 fathoms line, but got no bottom. It being thick squally weather, I could not attempt deeper soundings.

The column of *specific gravity* of sea-water calls for some remarks. Our measurements by the hydrometer show that in some parts, if not in most parts of the ocean, the water is specifically *lighter* at depths than at surface, when reduced to like temperature—the correction for this difference being applied. I found on one occasion the following large difference: On December 8th, at surface 1028.6, (distilled water as standard held at 1000,) at 200 fathoms 1028.4; at 500 fathoms, 1027.2, all at 60° temperature: this was in latitude 31° 42′ North, longitude 38° 12′ West. The specific gravity generally found at surface appears about 1028.4 at 60° temperature; and this specific gravity at surface appears, according to our record, more variable than at depths.

The greatest *transparency* of the water observed, as found in its column, was seventeen fathoms, being able to see a large lead, painted white, at that depth. This was in latitude 21° 4′ N., longitude 66° 36′ W.

The column of *barometer* contains the records of the improved marine mercurial barometer, got from Tagliabue, in New York, which proved to be an excellent instrument, and most valuable to me, never failing to warn of an approaching gale. The Aneroid, though not noticed in the "Abstract," was regularly recorded in the Log, with the Mercurial, every four hours during the cruise. This may serve as a good test of its performance. It was set with the *mercurial* on leaving New York in October. It commenced at once to differ, indicating higher; and, though its daily fluctuations agreed well, this difference steadily increased until, by the time we got back to New York, seven months after, it had reached as high as six-tenths of an inch above

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it; thus acquiring an error of very nearly one-tenth of an inch a month. This leads me to doubt whether this ingenious instrument can ever be sufficiently trusted to take the place of the mercurial, though it is so much to be desired.

The observations for the *variation of the compass* could be taken but seldom with exactness, and therefore appear but seldom in the "Abstract;" the needle being generally kept by our jumping little schooner in too unsteady a state for correct azimuths.

In conclusion, I must express my regrets that the most important part of the "Instructions" was prevented being carried out by the bad condition of the schooner, proving, on overhauling at Porto Praya, quite unseaworthy. I allude to the investigations of the currents about Cape St. Roque, and of the volcanic region of the South Atlantic near the equator. But I sincerely trust that the work will not be allowed to stop here—that it will be continued under your instructions, in connection with your "*Wind and Current Chart*," as has been authorized by Congress. The employment of three suitable vessels was recommended by the bill; but one has yet been employed, and that quite unsuitable in size and condition. A vessel of but one hundred tons, as is the "Taney," independent of being too unstable for the observations and the soundings, cannot carry officers and men enough for the incessant and laborious work required, nor provisions and water enough to keep the sea for long periods of time, as is essential on this service.

I have the honor to be, very respectfully, your obedient servant,

J. C. WALSH, *Lieut. U. S. N.*

To LIEUT. M. F. MAURY,

*Superintendent of the National Observatory, Washington.*

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C.

# ABSTRACT LOG OF THE "TANEY."



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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | | | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| 1849. Oct. 28 | Midn't. | ° ′ ″ | ° ′ ″ | | | | | | | | |
| | 8 A. M. | | | | | | Calm. | Stra's & Cir. Strat. | 6 | Stationary. | 30.16 |
| | 4 P. M. | 40 36 00 | 73 53 30 | | | S. S. E. | Light airs. | Cirro Strat. | 9 | Southward. | 30.2 |
| " 29 | Midn't. | 39 51 | 72 56 15 | | | South. | Moderate. | Cirro Strat. | 10 | S'd & W'd. | 30.15 |
| | 8 A. M. | 39 36 | 71 59 | | | S. S. E. | Fresh. | Cir. & Nimb. | 9 | Southward. | 30.10 |
| | 4 P. M. | 39 15 | 72 12 | | | S. S. E. | Fresh. | Nimb. | 10 | S. S. E. | 29.83 |
| " 30 | Midn't. | 39 16 40 | 72 20 | | | S. E. | Gale. | Nimb. | 10 | S. S. E. | 29.54 |
| | 8 A. M. | 39 15 | 72 30 | N. 40° W. | 0.4 | W. to N. W. | Gale. | Nimb. | 10 | Westward. | 29.65 |
| | 4 P. M. | 38 46 15 | 71 50 | | | N. W. | Gale. | Cirro Cum. | 8 | N'd & W'd. | 29.72 |
| " 31 | Midn't. | 37 52 | 71 41 | | | N. W. by N. | Gale. | Cum. & Nimb. | 9 | N'd & W'd. | 29.86 |
| | 8 A. M. | 37 26 | 71 27 | N. 14° E. | 1.25 | W. N. W. | Fresh with squalls. | Cumulus | 7 | W. N. W. | 29.91 |
| | 4 P. M. | 36 40 | 70 59 | Eastward. | 3.6 | W. N. W. | Gale. | Cirro Cum. Strat. | 9 | N. W. | 29.92 |
| Nov. 1 | Midn't. | 35 46 | 70 57 30 | | | W. N. W. | Fresh with squalls | Cum. Stratus & Nimbus & Cirri. | 8 | S. & W. N'd and W'd. | 30.02 |
| | 8 A. M. | 34 20 | 71 10 | N. 70° E. | 2.0 | N. W. | Fresh with squalls | Cum. Stratus. | 9 | N'd & W'd. | 30.09 |
| | 4 P. M. | 34 22 | 71 11 15 | Eastward. | 0.4 | W. N. W. | Fresh with squalls | Cum. Stratus. | 8 | W. N. W. | 30.16 |
| " 2 | Midn't. | 33 34 | 71 5 30 | | | N. W. by N. | Fresh. | Cum. Cir. & Nimb | 9 | W. N. W. | 30.25 |
| | 8 A. M. | 32 49 | 70 41 | S. 8° W. | 0.4 | W. to N. W. | Fresh. | Cum. & Cum. Strat | 10 | Northward. | 30.26 |
| | 4 P. M. | 32 18 | 70 12 | Westward. | 0.8 | N. N. E. | Moderate. | Cum. Stratus. | 10 | N'd & E'd. | 30.22 |
| " 3 | Midn't. | 31 56 30 | 70 3 | | | N. N. E. | Moderate. | Cumulus. | 8 | Northward. | 30.20 |
| | 8 A. M. | 31 36 | 69 54 | S. 20° E. | 0.5 | NW to N N E | Light airs. | Cum. Strat. & Cir's | 3 | S. W. | 30.21 |
| | 4 P. M. | 31 26 | 69 43 | Eastward. | 0.4 | N. to N. N. E. | Light airs. | Cirrus. | 1 | S. S. W. | 30.22 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 50 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | | | | | | SATURDAY, OCTOBER 27th, 1849.—Discharged the Pilot at 9 p. m. |
| 53. | 55. | | | | | | | SUNDAY, OCTOBER 28th, 1849.—At midnight took our departure—Northern light of Navesink bearing S. W., ½ W., distant 5 miles—Light Boat S. E. by E., distant 2 miles—At meridian Light Boat bore per compass N. E. ½ E., North light of Navesink W. by N., distant 4 miles—At 6 p. m. Navesink bore W. N. W.—Weather during this day pleasant—occasionally foggy. |
| 57. | 57. | | | | | | | |
| 57. | 57. | | | | | | | MONDAY, OCTOBER 29th, 1849.—Weather damp and unpleasant, with a head sea—At 10 a. m. hove to and sounded in 75 fathoms, soft ooze—At 1 p. m., observing the *barometer falling rapidly* prepared for a gale of wind—Wind freshening with the fall of the barometer, with threatening appearances—At 5 p. m. hove to on part tack, under foresail, with bonnet off—heavy sea and blowing a gale—From 8 to midnight, a very heavy, short and broken sea—and schooner being very deep labored badly, and shipped a great deal of water—At 11 p. m., wind lulled for a moment and suddenly shifted from S. E. to S. W., with a heavy fall of rain—Barometer at its lowest point at time of the sudden shift. |
| 59. | 56.5 | | | | | | | |
| 61. | 56. | | | | | | | |
| 60. | 58. | | | | | | | TUESDAY, OCTOBER 30th, 1849.—During this day until 8 p. m., fresh gales and cloudy with rain at intervals and a very heavy irregular and breaking sea—From 8 to midnight, gale moderated to fresh breezes with passing squalls—barometer steadily rising as per column. |
| 54.5 | 56. | | | | | | | |
| 55. | 61. | | | | | | | WEDNESDAY, OCTOBER 31st, 1849.—On the Western edge of Gulf Stream—Very ugly weather—From 4 to 8 a. m., fresh with heavy squalls accompanied by thunder, lightning, *hail, snow*, rain, and appearances of water-spouts—We saw to the Northward and Westward two columns of vapor rising from the sea to the clouds—From 8 to meridian moderate gales with heavy squalls and rain—The change of temperature of the water on getting into the Gulf Stream was remarkably sudden and great—At 8 a. m. it was 66°, and at 9 a. m. 73°, having run but 5 miles in the interval—At 10 a. m. 76°, at 11 a. m. 77°, the highest point during the day—At 6 p. m. it stood at 72°, having fallen gradually from noon—We suffered much with a very heavy irregular topping sea, which kept our decks flooded—Passed some sea-weed—*Portuguese men-of-war* and stormy petrels about us—The same bad weather continued throughout the day—From 8 to midnight, hail with rain accompanied the squalls, and a tremendous sea—Several rainbows and many water spouts were seen during the day—Weather would not permit sounding for deep sea temperatures. |
| 51. | 62. | | | | | | | |
| 54. | 65. | | | | | | | |
| 55. | 76. | | | | | | | |
| 54. | 72. | | | | | | | |
| 55. | 71.5 | | | | | | | THURSDAY, NOVEMBER 1st, 1849.—From midnight to 8 a. m. squally weather and occasional rain with heavy head sea—Occasional rainbows—Passed some gulf weed—From 8 a. m. to 4 p. m. frequent heavy squalls with rain—Numerous rainbows and much gulf weed and stormy petrels—From 4 to 8 p. m. weather improving—hove to and sounded for temperatures—Six's self-registering thermometer at 280 fathoms up and down indicated minimum 58°, maximum 74°, agreeing with the temperature of the water brought up by the wooden cylinder from the some depth which gave 58°, the maximum indicated by Six's being 2° higher than the surface temperature—Gulf weed floating by—Ends with better weather and rising barometer. |
| 57. | 72. | 71. | 280 fath's. 58° | | | | | |
| 58. | 72. | | | | | | | |
| 62. | 71. | | | | | | | FRIDAY, NOVEMBER 2d, 1849.—From midnight to 8 a. m., pleasant weather with heavy swell from Northward—passed a quantity of sea-weed—At meridian measured the specific gravity of surface water and found it as per column—At 1 p. m. hove to and tried temperatures with Six's thermometer, &c., at the depth of 100 fathoms, it indicated maximum 72.6° and 66.5°—A common thermometer in wooden cylinder with valves, indicated on being hauled up the same temperature at 100 fathoms as minimum by Six's, viz: 66.5°; at 50 fathoms, temperature 72°; transparency, 5 fathoms—Sea much rippied—Passed a quantity of sea-weed, and the first flying fish yet seen—At 7.30, tried temperatures as per column. |
| 67. | 72. | 72. | 67 | 5, rippled. | | 1028.3 | | |
| 65.5 | 72. | 71. | 67 | 14, smooth. | | | | |
| 66. | 73. | 72. | 68 | | 2°40′ W. | | | SATURDAY, NOVEMBER 3d, 1849.—From midnight to 8, pleasant—Passed quantity of sea-weed—At 9 a. m. tried temperatures as per column—Picked up some sea-weed, on which were found many small |
| 71. | 74. | | | | | | | |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | | | Set. | Velocity in knots per h'r. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Nov. 4 | Midn't. | 31 14 00 | 69 20 00 | | | S. E. | Light breeze. | Cumulus. | 3 | N'd. | 30.21 |
| | 8 A. M. | 31 7 | 68 42 | N. 34° E. | 0.7 | N. E. ½ E. | Moderate. | Cumulus. | 2 | N'd. & E'd. | 30.18 |
| | 4 P. M. | 30 46 | 67 54 | West'd. | 0.4 | N. E. | Moderate. | Cum. Stratus. | 5 | N'd. & E'd. | 30.12 |
| " 5 | Midn't. | 30 35 30 | 67 8 | | | N. E. | Moderate. | Cir. Cum. Strat. | 7 | E'd. | 30.11 |
| | 8 A. M. | 30 19 | 67 4 | S. 77° W. | 1.7 | N. E. by E. | Moderate. | Cir. Cum. Strat. | 9 | N'd. | 30.11 |
| | 4 P. M. | 30 5 | 66 36 40 | East'd. | 0.4 | N. E. by E. | Fresh. | Cir. Cum. Strat. | 8 | N'd. | 30.08 |
| " 6 | Midn't. | 30 5 20 | 66 38 | | | E. N. E. | Fresh. | Cir. Strat. & Cum. | 8 | N'd. & E'd. | 30.00 |
| | 8 A. M. | 30 16 20 | 66 43 15 | N. 49° E. | 0.12 | N. E. by E. | Fresh. | Cum. Stratus. | 9 | N. E. | 29.98 |
| | 4 P. M. | 30 23 | 66 49 | East'd. | 1.0 | N. E. by E. | Fresh. | Cir. Cum. Strat. | 9 | N'd. & E'd. | 29.96 |
| " 7 | Midn't. | 30 33 | 66 50 | | | N. E. by E. | Fresh. | Cir. Strat. & Cum. | 6 | N'd. & E'd. | 30.09 |
| | 8 A. M. | 30 22 30 | 66 41 | S. 30° E. | 0.3 | N. E. by N. | Fresh. | Cir. Cum. Stratus. | 8 | N. N. E. | 29.99 |
| | 4 P. M. | 30 8 | 66 21 | | | N. E. | Moderate. | Cir. Cum. Stratus. | 6 | N. E. | 30.00 |
| " 8 | Midn't. | 29 58 | 66 57 | | | N. E. by E. | Moderate. | Cum. Stratus. | 4 | N. E. | 29.99 |
| | 8 A. M. | 30 3 | 65 38 | N. 19° E. | 0.4 | N. E. by E. | Moderate. | Cirro Cum. Strat. | 7 | N'd. & E'd. | 29.97 |
| | 4 P. M. | 30 31 30 | 65 23 30 | East'd. | 0.25 | E. by S. | Light breezes. | Cirro Cum. Strat. | 6 | N'd. & E'd. | 29.95 |
| " 9 | Midn't. | 30 51 | 64 55 | | | S. E. by E. | Moderate. | Cir. Cum. Strat. | 3 | Stationary. | 30.04 |
| | 8 A. M. | 31 3 | 64 52 | S. 86° E. | 1.0 | S. E. by E. | Light breezes. | Cum. Stratus. | 8 | S'd. & E'd. | 29.96 |
| | 4 P. M. | 31 23 | 63 56 | | | S. by W. | Moderate. | Cir. Cum. Strat. | 6 | S'd. | 29.95 |
| " 10 | Midn't. | 31 33 | 63 18 | | | South | Light breezes. | Cum. Stratus. | 5 | Stationary. | 30.03 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. | | | | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| Air. | Water. Surface. | Water. 50 fath's | Water. 100 fathoms. | | | | | |
| o | o | o | o | | | | | |
| | | 74. | 67 | | | | | crabs, a small gar fish and other very small fish, all of which were bottled for preservation as specimens—More *sea-weed* than yet seen—At noon tried specific gravity of sea water, as per column—From 4 to midnight pleasant—At 5 p. m., tried temperatures as per column—The self-registering Six's thermometer indicated near the same as those in the wooden cylinders, viz: at 100 fathoms minimum 67° maximum 76°—2° above surface temperature—Swell from the Nd. —water slightly phosphorescent—quantity of sea-weed. |
| 70. | 74. | | | | | | | |
| 69. | 74. | 72. | 68 | | | | | |
| | | | 90 fath's. | | | 1028.3 | | |
| | | | | | | 100 fath. | | |
| 75. | 74. | 71. | 70° | 11½ | | 1028. | | SUNDAY, NOVEMBER 4th, 1849.—From midnight to 8 pleasant—At 5 p. m. hove to and tried temperatures as per column—Small patches of sea-weed in a decayed state passed us arranged in long parallel lines in the direction of the wind—schools of flying fish seen—swell from N. N. E.—At 1 p. m. tried temperatures as per column—At 6 p. m. hove to and tried temperatures as per column—Ends pleasant. |
| 71. | 74. | 73. | 68 | | | | | |
| 71. | 73.5 | 75.5 | 70 | | | | | |
| 73. | 75. | 74. | 76 | | | | | MONDAY, NOVEMBER 5th, 1849.—At 6 a. m. sounded for temperatures as per column—much sea-weed—many flying fish—At 2.30 p. m. sounded for temperatures as per column, the common thermometer in wooden cylinders agreeing with Six's—Heavy sea running from N. E.—At 6, hove to in a blow from N. E. with very heavy head sea. |
| 73. | 75.5 | | | | | | | |
| 72.5 | 76. | | | | | | | TUESDAY, NOVEMBER 6th, 1849.—During this day lying to against a heavy head sea and strong N. E. wind—At 11 a. m. took the temperatures of the water as per column—At 5.50 took temperatures as per column—Passed many patches of sea weed—The sea very phosphorescent. |
| | | 74.5 | 68.5 | | | | | |
| | | | 350 fath's. | | | 1028.5 | | |
| | | | | 5, much rippled. | | 350 fath. | | WEDNESDAY, NOVEMBER 7th, 1849.—During this day pleasant weather—At 9 a. m. sounded for temperatures as per column—Some sea-weed —swell from the N. E.—At 4 p. m. took temperatures as per column. |
| | | | 75.5° max. | | | | | |
| 75. | 75. | | 67° min. | | | 1028.3 | | THURSDAY, NOVEMBER 8th, 1849.—Midnight, to 8 a. m., pleasant, with a slight N. E. swell—At 6.30, sounded for water temperatures as per column—8 a. m. to 4 p. m. pleasant—At 1, tried temperatures as per column—Bunches of sea-weed floating by—4 to 8 pleasant—passed larger and more numerous patches of sea-weed than yet seen—Dolphins, flying fish and a flock of Oceanic birds were seen—The lower range of clouds "Stratus" was observed to move rapidly to the S. W., while the upper range "Cirrus" remained stationary, and also, the "Cumulus" stationary about the horizon—At 7 p. m. took temperatures—water phosphorescent—Ends with heavy swell from N. E. |
| | | 70 f. | 120 fath's. | | | | | |
| | | o | 65.8° | | | | | |
| | | 69.5 | 120 fath's. | | | | | |
| 72.5 | 74.5 | | 65.8° by Six's. | | | | | |
| 72. | 73.5 | | | | | | | FRIDAY, NOVEMBER 9th, 1849.—Commences pleasant—At 4 a. m. sounded for temperatures as per column—Swell from S. E. and lightning to the W'd.—At 1 p. m. sounded for temperatures as per column—Some sea-weed and flying fish—Swell from the S'd. at 4 p. m.—At 7 p. m., sounded for water temperatures—From 8 to midnight lightning along the Western horizon—Water phosphorescent—at midnight sounded for temperatures as per column. |
| | | 74. | 69° | 6, much rippled. | | | | |
| 73. | 75.5 | 73.7 | 70 | | | | | |
| 72. | 75.5 | | | | | | | SATURDAY, NOVEMBER 10th, 1849.—Commences pleasant with squally appearances—a light shower of rain at 6 a. m.—Lightning in the Northern horizon—At 6.30, a rainbow to the N. W., which lasted until 7—Passed many patches of sea-weed—At 9 sounded for water temperatures as per column—At 5, being calm, tested "*Maury's Sounding Indicator*," and after several trials at various depths, found its indications to be nearly correct—but 5 fathoms error in 100 fathoms up and down—From 6 to 8, a long S. E. swell and lightning along the horizon —8 to midnight, lightning at the S'd. and E'd.—A long swell from S'd. and E'd.—At 6, sounding for water temperatures as per column. |
| | | | | 6, much rippled. | | | | |
| | | 75.8 | 68.8 | | | | | |
| 72.5 | 75.5 | | | | 3° W. | | | |
| | | | 120 fath's. | | | | | |
| | | 75. | 66.3° | 8, much rippled. | | 1028.5 | | |
| 76. | 75.5 | | | | | | | |
| 72. | 74. | | | | | | | SUNDAY, NOVEMBER 11th, 1849.—Commences with squally appearances and occasional showers of rain—Lightning to the northward and to the southward and eastward—At 9 a. m., tried temperatures as per column—At 6 p. m. lightning to the eastward—passed much sea-weed during the day—At midnight took temperatures as per column—A long irregular swell from the northward and eastward. |
| | | 71. | 69 | | | | | |
| 70. | 74. | | | | | | | |
| | | 74.5 | 66.3 | minimum. 11, smooth. | | | | |
| 77. | 74. | | | | 7° W. | 1028.7 | | MONDAY, NOVEMBER 12th, 1849.—Commences pleasant, with a long irregular swell and lightning about the horizon from S. to E.—From 4 to 8 a. m. a shoal of porpoises about the schooner—At 1 p. m. took temperatures as per column—At 9 p. m., took temperatures as per column—Passed a quantity of gulf-weed during the day—A heavy irregular swell. |
| | | | 200 fath's. | | | 100 fath. | | |
| | | | 67.2° | | | | | |
| | | 73.8 | 69.8 | | | 1028.3 | | |
| 73. | 74. | 74. | 69. | | | | | |



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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | | | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from. | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Nov. 10 | 8 A. M. | 31 44 30 | 62 54 | N. 84° W. | 0.5 | S. S. W. | Light breezes. | Cum. Stratus. | 6 | S'd. & W'd. | 30.04 |
| | 4 P. M. | 31 43 | 62 32 | East. | 0.4 | W. S. W. | Light airs. | Cum. Stratus. | 8 | S'd. | 30.04 |
| " 11 | Midn't. | 31 44 00 | 62 30 | | | | Calm. | Cum. Stratus. | 5 | W. N. W. | 30.03 |
| | 8 A. M. | 31 43 | 62 30 | S. 77° W. | 0.75 | North. | Very light. | Cirro Stratus. | 6 | Southward. | 30.02 |
| | 4 P. M. | 31 44 | 62 08 | East. | 0.4 | N. E. | Very light. | Cirro Stratus. | 9 | S. E. & N. E. | 30.02 |
| " 12 | Midn't. | 31 46 | 61 44 | | | East. | Light breeze. | Stratus. | 3 | Southward. | 30.01 |
| | 8 A. M. | 31 47 30 | 61 32 30 | S. 80° W. | 0.6 | N. by W. | Light breeze. | Cirro Stratus. | 3 | N. W. | 30.00 |
| | 4 P. M. | 31 51 30 | 59 57 | West. | 0.6 | W. N. W. | Light breeze. | Cirro Cum. Strat. | 8 | N'd & W'd. | 29.97 |
| " 13 | Midn't. | 31 57 | 60 17 | | | W. N. W. | Light breeze. | Stratus. | 5 | Westward. | 29.99 |
| | 8 A. M. | 32 02 | 59 44 | N. 10° E. | 0.1 | W. N. W. | Light breeze. | Cirro Cum. Strat. | 6 | N'd & W'd. | 29.99 |
| | 4 P. M. | 32 27 30 | 59 18 15 | | | N. W. | Moderate. | Cum. Stra. & Nim. | 7 | N. N. W. | 29.97 |
| " 14 | Midn't. | 32 58 30 | 59 00 | | | N. W. | Mod. with squalls. | Cum. Stratus. | 6 | Northward. | 30.00 |
| | 8 A. M. | 32 32 30 | 58 50 30 | S. 22° E. | 0.8 | NW to NNE. | Light breeze. | Cum. Stra. & Nim. | 5 | Northward. | 30.03 |
| | 4 P. M. | 32 21 | 58 31 10 | Eastward. | 2. | N. N. E. | Light breeze. | Cumulo Stratus. | 7 | N'd & E'd. | 30.03 |
| " 15 | Midn't. | 32 8 00 | 58 36 00 | Westward. | | NNE & NW. | Moderate. | Stratus. | 2 | N. N. E. | 30.05 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | Water. Surface. | Water. 50 fath's | Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 72. | 74. | 74. | 68.8 | 14, smooth. | | | | TUESDAY, NOVEMBER 13th, 1849.—Commenced this day the search for the "False Bermudas,"—At 5 a. m. took temperatures as per column—At 11 a. m. a squall of wind and rain from N. W.—At 3 p. m. sounded with 550 fathoms, *line* up and down; no bottom; and took temperatures as per column—The two Six's thermometers at 450 and 550 fathoms came up out of order—The markers had penetrated the mercury—From meridian to 4 p. m. two small land birds flew on board—At 6 p. m. sounded with 200 fathoms up and down; no bottom; and took temperatures as per column—At 8 p. m. sounded with 200 fathoms up and down; no bottom; and took temperatures as per column—At midnight sounded with 100 fathoms up and down; no bottom; and took temperatures as per column—Passed during the day numerous bunches of sea-weed—several shoals of flying-fish—Ends squally with rain. |
| 77. | 74. | | | | 4°20′ W. | | | |
| | | 71. | 69. | | | | | |
| 72. | 73.5 | 71.5 | 69. | | | | | |
| 71. | 73. | 73.5 | 67.5 | | | | | |
| 73. | 73.5 | | | | | | | |
| 71. | 73. | 73.8 | 68.5 | | | | | WEDNESDAY, NOVEMBER 14th, 1849.—"*In search of the False Bermudas*"—At 4.30 a. m. sounded with 100 fathoms; no bottom; and took temperatures as per column—At 11 a. m. sounded with 300 *fathoms*; no bottom; and took temperatures as per column—(Position of this sounding, latitude 32° 21′ N., longitude 58° 48′ W.)—At 3 p. m. sounded with 800 fathoms, line up and down; no bottom; (in latitude 32° 22′ N., longitude 58° 31′.30 W)—The Six's thermometer at 800 *fathoms*, came up *broken*; the temperature, at 800 fathoms by thermometer, in wooden cylinder, 63°, (0.5° deducted for correction as per column,) the cylinder came up *split through* and compressed in the middle and otherwise distorted by the pressure at that great depth—Passed numerous bunches of sea-weed, but no indications whatever of rocks or shoal water—(Position at 6h. 30m., p. m., latitude 32° 24′ N., longitude 58° 19′ W.)—At midnight, sounded with 200 fathoms, up and down; no bottom; and took temperatures as per column—Ends pleasant weather. |
| 71. | 73.5 | | | | | | | |
| 76. | 73. | 73.8 | 68.4 | 5, much rippled. | | | | |
| 71. | 72.5 | 72.5 | 68.2 | | | | | |
| 70.5 | 72.5 | 72.8 | 68.5 | | 8°30′ W. | | | |
| | | | 350 fath's. 64.8° | | | | | THURSDAY, NOVEMBER 15th, 1849.—*In search of the False Bermudas.*—Commences pleasant, with light variable airs—From 8 a. m. to meridian, weather being favorable and every indication of its continuance, and the sea smoother than we have yet had it—All hands employed in getting up and shipping the wire reel and stand, and the fair leader over the stern, preparatory to sounding—A 9h. 30m., a. m., lowered a boat and tried the current, found a very slight drift to W. S. W.—At 1h. 25m., p. m., started the wire machine, and at 2h. 55m. p. m., had reeled off 5,700 fathoms, *dead up and down*, without striking bottom, when the wire parted at one of the links on the reel—We had observed some of the links of this large sized wire to catch at times on others upon the reel, endangering a break, and in consequence, at the time it parted, we were reeling off very slowly and carefully checking it by the friction band, which worked admirably—A link going off the reel caught in another under it upon the reel and before it could be extricated, it snapped in the middle of the link This was the largest sized wire, No. 7—The whole time of reeling off, the wire went down *perfectly plumb*—it served as an anchor to keep the vessel steady, and there was at no time a variation of one-half a degree from the "*plumb*"—We were highly encouraged, expecting to strike bottom every moment, and our sorrow and disappointment upon the break and loss of the wire, great indeed—The immense depth of 5,700 *fathoms* we believe to be the greatest depth of the ocean *ever yet measured*—There would have been no difficulty in reeling it up—We had tried several times, the last time at 5,000 fathoms, and found that 4 men by the aid of our powerful machine, could reel up with perfect ease—It would no doubt have taken much time, (20 or 24 hours,)—The position of this sounding was by a number of sets of morning, noon and afternoon observations in latitude 31° 59′ N., longitude 58° 43′.25 W., it being calm throughout the time and no change in position—This position is in the immediate vicinity of the assigned position of the rocks called the False Bermudas, for which we are in search—Unshipped and struck the wire sounding-apparatus below—While doing so the schooner commenced rolling and a davit in the starboard side to which one of the guys was made fast, *drew* and the |
| | | | 250 fath's. 68.5° | | | | | |
| 74. | 72. | 72.5 | 70.8 | 6, much rippled. | | 1029.5 gr. | 550 | |
| | | 73.5 | 140 fath's. 67° | | | 500 fath's | 200 | |
| | | | 90 fath's. 72.5° | | | 1028.8 gr. | | |
| 70. | 72.8 | 71.5 | 200 fath's. 67° | | | | | |
| | | | 100 fath's. 67° | | | | | |
| 67.5 | 72.5 | 72.7 | 67 | | | | | |
| | | | 71 | | | | | |
| | | 73.2 | 300 fath's. 63° | 10, rippled. | | | 300 | |
| 72. | 72.5 | | | | | | 800 | |
| | | | 800 fath's. 62.5° | | | | | |
| | | | 130 fath's. 72.8° | | | | | |
| 70. | 73. | | | | | | 200 | |
| | | | 200 fath's. 66° | | | | | |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | | | Set. | Velocity in knots per. h. | Direction. | Force. | Winds. | Portion. | Motion from. | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Nov. 15 | 8 A. M. | 32 1 00 | 58 42 | S. 16° E. | 0.8 | N. to N. N. W | Light var. airs. | Cum. Stratus. | 3 | Northward. | 30.07 |
| | 4 P. M. | 31 59 | 58 44 30 | | | | Calm. | Cum. Stratus. | 3 | Stationary. | 30.07 |
| 16 | Midn't. | 32 10 | 58 59 | | | S. W. | Very light breeze. | Cum. Stra. & Nim. | 9 | S'd & E'd. | 30.00 |
| | 8 A. M. | 32 15 | 57 07 30 | | | | Calm. | Cum. Stratus. | 10 | Stationary. | 29.97 |
| | 4 P. M. | 32 21 | 59 6 | | | N. E. | Gale. | Nimbus. | 10 | N'd & E'd | 29.95 |
| " 17 | Midn't. | 32 8 | 59 17 | | | E. N. E. | Gale. | Nimbus. | 10 | N. E. | 29.94 |
| | 8 A. M. | 32 35 | 59 32 | N. 65° W. | 0.3 | East. | Gale. | Nimbus. | 10 | E. N. E. | 21.29 |
| | 4 P. M. | 32 40 | 59 41 | West. | 0.3 | East. | Gale. | Cum. Stra. & Nim. | 10 | E. N. E. | 29.92 |
| " 18 | Midn't. | 32 25 | 59 50 | | | E. N. E. | Gale. | Cum. Stra. & Nim. | 10 | N'd & E'd. | 29.92 |
| | 8 A. M. | 32 19 30 | 59 56 | S. 30° W. | 0.3 | E. N. E. | Gale. | Nimbus. | 10 | East. | 29.91 |
| | 4 P. M. | 32 14 | 60 6 | | | E. S. E. | Gale. | Nimbus. | 10 | S'd & E'd. | 29.83 |
| " 19 | Midn't. | 32 13 | 60 15 | | | S. E. | Gale. | Nimbus. | 10 | S. S. E. | 29.79 |
| | 8 A. M. | 32 17 | 60 00 | | | S. S. E. | Moderate. | Cir. Cum. Stra. & Nim. | 8 | S. & N. W. | 29.82 |
| | 4 P. M. | 32 20 | 59 00 20 | S. 31° E. | 0.2 | S. W. | Moderate. | Cum. Stratus | 6 | S. W. | 29.79 |
| " 20 | Midn't. | 32 30 | 58 31 | | | W. by S. | Moderate. | Cir. Cum. Stratus. | 3 | S'd & W'd. | 29.89 |
| | 8 A. M. | 32 44 | 58 11 | N. 59° W. | 1.3 | West. | Light breeze. | Cum. & Cir. Stra. | 3 | N'd & W'd. | 29.93 |
| | 4 P. M. | 32 34 | 57 51 | | | S. W. | Moderate. | Cir. Cum. Stra. | 6 | Westward. | 29.33 |
| " 21 | Midn't. | 32 9 | 57 23 | | | S. S. W. | Light breeze. | Cirr. Stratus. | 3 | S'd & W'd. | 29.93 |
| | 8 A. M. | 32 3 | 57 33 | N. 17° E. | 0.8 | S. by W. | Moderate. | Cum. Stratus. | 5 | Southward. | 29.95 |
| | 4 P. M. | 31 49 30 | 55 41 | East. | 0.3 | S. by E. | Moderate. | Cir. Cum. Stra. | 9 | Southward. | 29.91 |
| " 22 | Midn't. | 31 31 | 56 8 | | | S. ½ W. | Moderate. | Cum. Stratus. | 9 | Southward. | 29.85 |
| | 8 A. M. | 31 34 | 55 49 | N. 70° E. | 1.0 | South. | Light breezes, with squalls. | Cir. Cum. Stra. & Nim. | 10 | Southward. | 29.72 |
| | 4 P. M. | 31 27 | 55 53 | | | Southward. | Light variable airs | Nimbus. | 9 | S'd & N'd & W'st'd. | 29.69 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 50 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 69. | 73. | | | | | | | heavy reel surged violently three or four times from side to side—Mr. Marcy, the master, while attempting to get hold of the guy, was struck and knocked down by the reel, whereby his right collar bone was fractured—The hammock nettings on both sides were shattered by the reel surging against them—It was lowered upon deck as soon as possible, and afterwards struck below without further accident, though with much difficulty—The wire had nothing attached to it but a 10 lb. lead with "*Stellwagen cone*" and "*Maury's Indicator*"—regretted much the loss of the last—Noticed dolphin, flying-fish, lugger-fish, and numerous patches of sea-weed during the day—At 10h. 30m. p. m., a squall from W. S. W. with rain—Ends pleasant. |
| 77. | 73.5 | | | | | | 5700 | |
| 72. | 73. | | | | | | | |
| 68. | 73. | 72.8 | 67. | 9, rippled. | | | | |
| 69. | 72.8 | | 68. | | | | | |
| 67. | 72.8 | | | | | | 120 | |
| 66. | 72. | | 69. | | | | 112 | FRIDAY, NOVEMBER 16th, 1849.—*In search of the "False Bermudas."*—Commences with rain—At 11 a. m. took temperatures as per column—From meridian to 4, rain with fresh gales—hove to at 2 p. m. under fore-sail with bonnet off—Barometer falling, and heavy sea getting up—Took temperatures at 5 as per column—Ends with a gale from East—heavy sea and rain—water phosphorescent—At midnight, sounded with 120 fathoms, no bottom. |
| | | 70f's | 120 fath's. | | | | | |
| | | 72.2 | 67.3° | | | | 120 | |
| 68. | 72. | | | | | | | |
| 68. | 72. | | | | | | | SATURDAY, NOVEMBER 17th, 1849.—*In search of the "False Bermudas."*—Throughout this day, hove to, in a strong gale of wind and rain, with a very heavy sea from the eastward—Schooner very wet and uncomfortable, as usual—Sounded at 6h. 30m., a. m., 112 fathoms, no bottom; and took temperatures as per column—At 1 p. m. sounded with 120 fathoms, no bottom; and took temperatures as per column—At 10 p. m. sounded with 110 fathoms, no bottom; and took temperatures as per column—Passed much sea-weed. |
| | | 71.5 | 67. | | | | | |
| 67. | 72. | | | | | | | |
| 72. | 72.5 | | | | | | | |
| 70. | 72.5 | | | | | | | |
| | | 73. | 67. | | | | | SUNDAY, NOVEMBER 18th, 1849.—*In search of the "False Bermudas."*—Commences with very bad weather and wind unsteady—At times light and then in heavy squalls with rain, with a heavy head sea—From 8 a. m. to 4 p. m., stormy weather and occasional showers of rain—frequent heavy squalls—Schooner laboring badly and very wet, as usual—From 4 to 6 p. m., scud passing from the southward and westward—From 6 to 8 heavy squalls of wind and rain with lightning to the southward and eastward—From 8 to midnight, blowing in heavy squalls—At midnight raining in torrents, very thick with frequent flashes of vivid lightning, all around the horizon—During the whole day, lying to on port tack and drifting bodily to leeward—At 11 p. m. observing the wind to be hauling and heading us off into the trough of the sea; wore ship, and found schooner lay to more easy on starboard tack—Passed during the day quantities of sea-weed, arrayed in long parallel lines in the direction of the wind. |
| 70. | 72. | | | | | | | |
| 74. | 72.5 | 73.3 | 67.5 | | | | | |
| | | 73.2 | | | | | 300 | |
| 72. | 72.5 | 72. | | | | | 200 | |
| | | | 80 fath's. | | | | | |
| | | | 69.5° | | | | | |
| | | | 120 fath's | | | | 200 | |
| | | | 68.2° | | | Surface. | | MONDAY, NOVEMBER 19th, 1849.—*In search of the "False Bermudas."*—Weather moderating—Barometer rising slowly—Midnight until 4 a. m. wind unsteady with squalls, with rain and lightning—took temperatures as per column—From 4 to 8 a. m. moderate—8 to meridian, pleasant—At 8, made sail in continuation of search for the "False Bermudas"—Swell from the S. W.—At 11 a. m. took temperatures as per column—At 5.30 p. m., sounded with 300 fathoms, up and down, *no bottom;* and temperatures, as per column—From 6 to 8, lightning to the northward, and water phosphorescent—At midnight, sounded with 200 fathoms, *no bottom;* temperatures as per column—Passed during the day numerous patches of sea-weed—Ends pleasant, with swell from the westward. |
| | | | | | | 1029.4gr. | | |
| | | | 800 fath's. | | | 800fath's | | |
| | | | 61.° | | | 1028.5gr. | 800 | |
| 77. | 73. | | | | 7°30′ W. | | | |
| | | 71.2 | 68.5 | | | | | |
| 72. | 73. | | | | | | | |
| | | | 69. | | | | | |
| 71.5 | 73. | | | | 6°20′ W. | | | TUESDAY, NOVEMBER 20th, 1849.—In search of the "False Bermudas."—At 4 a. m., sounded with 200 fathoms, *no bottom;* and took temperatures as per column—At 7.30 a. m. hove to for sounding—From 8 to meridian, employed sounding with 800 fathoms line, up and down, *no bottom*—Wooden cylinder containing thermometer came up crushed in consequence of the pressure, and the thermometer showed surface temperature—took specific gravity of sea water at 800 fathoms, brought up by metal cylinder, and also at surface as per column—The water in metal cylinder from 800 fathoms showed temperature 62°, one degree is subtracted, being the correction for change in hauling up—At 4.20 p. m. found that the fly of Maury's patent log had twisted off—Put on a new one and set it again—At 8 p. m. sounded |
| | | 71.8 | 70.5 | | | | | |
| 75. | 73. | 72. | 70.2 | | | | | |
| 72. | 73. | | | | | | | |
| 67. | 73. | | | | | | | |
| | | 72.7 | 66.2 | | | | 200 | |
| 68. | 73. | 72.4 | 67. | | | | 200 | |



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| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Nov. 23 | Midn't. | 31 4 | 55 54 | | | W. N. W. | Moderate. | Cum. Stratus. | 6 | Westward. | 29.76 |
| | 8 A. M. | 31 1 | 55 59 | | | N. W. | Moderate. | Cumulus. | 4 | N. W. | 29.80 |
| | 4 P. M. | 31 19 | 55 46 30 | N. 67° E. | 0.7 | N. by E. | Fresh. | Cumulus. | 7 | N'd and E'd. | 29.85 |
| " 24 | Midn't. | 31 26 | 55 50 | | | N. by E. | Fresh. | Cum. Stratus. | 6 | N'd and W'd. | 29.92 |
| | 8 A. M. | 31 9 | 56 8 | | | N. N. E. | Fresh. | Cum. Stratus. | 8 | Northward. | 29.89 |
| | 4 P. M. | 30 56 | 56 31 | East. | | N. by E. | Fresh. | Cum. Stratus. | 7 | N'd and W'd. | 29.94 |
| " 25 | Midn't. | 31 00 | 56 50 | | | N. by E. | Fresh. | Cum. Stratus and Nimbus. | 6 | N. N. E. | 29.95 |
| | 8 A. M. | 30 52 | 57 20 | | | N. E. by N. | Gale. | Cum. Stratus and Nimbus. | 7 | N. E. | 29.96 |
| | 4 P. M. | 30 53 | 57 27 | | | N. E. | Gale. | Cum. Stratus. | 9 | N. N. E. | 30.04 |
| " 26 | Midn't. | 30 52 30 | 57 34 | | | N. E. | Gale. | Cum. Stratus. | 6 | N. E. | 30.08 |
| | 8 A. M. | 30 54 | 57 57 | N. 86° W. | 0.8 | N. E. | Gale. | Cum. Stratus. | 8 | N. E. | 30.14 |
| | 4 P. M. | 31 5 30 | 58 1 | | | N. E. | Fresh. | Cum. Stratus. | 8 | N. E. | 30.20 |
| " 27 | Midn't. | 31 36 | 58 4 | | | E. by N. | Fresh. | Cum. Stratus. | 9 | East. | 30.32 |
| | 8 A. M. | 31 52 | 58 5 | N. 45° W. | 0.9 | E. S. E. | Light breezes. | Cirro Stratus. | 9 | S. E. | 30.23 |
| | 4 P. M. | 31 58 40 | 57 40 | | | S. E. by S. | Moderate. | Cir. Cum. Strat. | 9 | East. | 30.15 |
| " 28 | Midn't. | 32 00 40 | 57 23 | | | S. E. | Light airs. | Cum. Stratus. | 10 | S. W. | 30.16 |
| | 8 A. M. | 31 50 | 56 46 15 | N. 45° W. | 0.7 | S. by W. | Moderate. | Cirro Cumulus. | 8 | Southward. | 30.15 |
| | 4 P. M. | 31 26 | 56 7 | | | S. S. W. | Moderate. | Cirro Stratus. | 4 | S. W. | 30.07 |
| " 29 | Midn't. | 31 20 | 55 34 | | | S. by W. | Moderate. | Cirro Cumulus. | 9 | S'd. & W'd. | 30.12 |
| | 8 A. M. | 31 30 | 54 40 | N. 15° W. | 1.0 | S. by W. | Moderate. | Cirro Stratus. | 9 | Southward. | 30.08 |
| | 4 P. M. | 31 30 | 53 44 | | | S. by W. | Moderate. | Cir. Cum. Stratus and Nimbus. | 9 | Southward. | 30.06 |
| " 30 | Midn't. | 31 46 | 53 10 | | | W. N. W. | Moderate. | Cirro Stratus. | 8 | Westward. | 30.07 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. | | | | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| Air. | Water. | | | | | | | |
| | Surface. | 50 fath's | 100 fathoms. | | | | | |
| ° | ° | ° | ° | | | | | |
| 68. | 72.5 | | 67. | | | | 130 | with 100 fathoms, and took temperatures as per column—Passed during the day much sea-weed, arranged in parallel lines in direction of the wind as usual, also noticed many flying-fish and dolphin— |
| | | | | | | | 250 | |
| 68. | 72. | | | | | | 300 | Ends pleasant, with a S. W. swell. |
| | | 72.3 | 68. | 9, rippled. | | | | WEDNESDAY, NOVEMBER 21st, 1849—Commences pleasant—At 2 a. m. sounded for temperatures, as per column—At meridian sounded for temperatures as per column—At 4.40 p. m. sounded for temperatures |
| 70. | 72. | | | | | | | |
| | | 72.5 | 68. | | | | 200 | as per column—Swell from the southward throughout the day. |
| 68. | 72. | | | | | | | THURSDAY, NOVEMBER 22d, 1849.—*Commenced search for "Nye's Rock."* —Commences squally with rain—From 8 a. m. to meridian, rainy |
| | | 71. | | | | | 200 | weather with short irregular sea—At 10.30 a. m. sounded with 200 *fathoms, no bottom;* and took temperatures as per column—From 4 to |
| 68. | 72. | | | | | | | 6 p. m. squalls of wind and rain—At 8 p. m. sounded with 200 *fath-* |
| | | 72. | 69. | | | | 200 | *oms*, no bottom; and took temperatures as per column—At midnight sounded with 130 *fathoms*, no bottom; and took temperatures as per |
| 71. | 72. | | | | | | | column—Wooden cylinder at 130 *fathoms*, came up *empty*—Ends |
| | | 71. | 67.5 | | | | 200 | pleasant, with swell from the westward. |
| 68. | 72. | 71. | 67.5 | | | | | FRIDAY, NOVEMBER 23d, 1849.—*In search of "Nye's Rock."*—Commences pleasant—squally appearances—At 4 a. m. sounded with 250 *fathoms, no bottom;* swell from the westward—Passed numerous |
| 68. | 72. | | | | | | | patches of sea-weed—At 10 a. m. sounded with 300 *fathoms*, no bottom; temperatures as per column—Passed a small piece of drift-wood, and patches of sea-weed—Meridian to 4 p. m. squally with |
| 71. | 72.5 | 72. | | | | | | occasional rain—At 3 p. m. sounded with 300 *fathoms*, no bottom— large quantities of sea-weed floating by—a heavy sea running from N. W.—From 4 to 6, frequent heavy squalls with rain—At 6 p. m. |
| | | | | | | | 200 | hove to—sounded with 200 fathoms, no bottom; temperatures as per |
| 69. | 72. | | | | | | | column—At 8 p. m. made sail again. |
| | | | | | | | | SATURDAY, NOVEMBER 24th, 1849—"In search of Nye's Rock."— |
| 68. | 72. | | | | | | | Commences pleasant, with squally appearances and N. W. swell—At |
| | | 70. | 69. | | | | | 4 a. m. sounded with 200 *fathoms, no bottom;* the lower cylinder came |
| 70. | 72. | | | | | | | up empty, temperatures as per column—From 8 to meridian, squally with occasional rain—At 11.30 a. m. sounded with 200 *fathoms*, no |
| 69. | 71. | | | | | | | bottom; temperatures as per column—heavy sea running from N. W. —At 5.30 p. m. sounded with 200 *fathoms*, no bottom; temperatures as per column—From 6 to 8, wind blowing in heavy puffs and threat- |
| 68. | 71.5 | | | | | | | ening appearances—Passed a quantity of sea-weed during the day, arranged in long parallel lines, in direction of the wind—Also fly- |
| | | | | | | | | ing-fish and some oceanic birds. |
| | | 71.3 | 67. | 5, much rip- | | | | SUNDAY, NOVEMBER 25th, 1849.—*In search of "Nye's Rock"*—Commences with rain and squalls, and heavy sea—From 8 a. m. to 4 p. m., fre- |
| 71. | 71.5 | | | pled. | | | | quent hard squalls with rain—Several rainbows—4 to midnight, weather moderating, but occasional heavy squalls with rain—At 5, |
| 69.5 | 71.6 | | | | | | | sounded with 200 fathoms, no bottom—Heavy sea running from N. E. throughout the day—Passed much sea-weed. |
| | | | | | | | | MONDAY, NOVEMBER 26th, 1849.—*In search of "Nye's Rock"*—Com- |
| | | 71. | 67. | | | | | mences, and until 4 p. m. squally weather, with occasional rain and |
| 70. | 72 | | | | | | | heavy N. E. swell—Much sea-weed and oceanic birds—At 8 a. m., took temperatures as per column—From 4 to 6 p. m., some grey |
| | | 72. | | | | | 200 | gulls were seen—Ends pleasant. |
| 75. | 71.8 | | | | | | 600 | TUESDAY, NOVEMBER 27th, 1849.—*In search of "Nye's Rock:*—Commences pleasant—Made sail in continuation of search for *"Nye's Rock"*—At |
| | | | | | | | | 11.15 a. m., took temperatures as per column—Noticed much sea- |
| 72. | 71.6 | 71. | | | | | | weed, and several birds of the kind called "Boobies and Boatswains" —Ends pleasant, with a long swell from the Eastward. |
| | | | | | | | | WEDNESDAY, NOVEMBER 28th, 1849.—*In search for "Nye's Rock"*—At 6 |
| | | 71. | 68. | | | | 200 | a. m., sounded with 100 fathoms, no bottom—At 1 p. m., sounded |
| 72. | 71.5 | | | | 10°30′W | | | with 200 fathoms, no bottom; and took temperatures as per column— |
| | | 71. | | | | | | Cylinder at 200 fathoms came up empty—At 8 p. m. sounded with |
| 74. | 71 | 70.5 | 68. | 10, rippled. | | 1029 | | 600 fathoms line, no bottom—Cylinder at 300 and 600 came up with water, shewing surface temperature—At 8.30 p. m., filled away and |
| | | | | | | | | stood to the Eastward—passed much sea-weed during the day, ar- |
| 70. | 71 | 70.5 | | | | | | ranged in parallel lines in direction of the wind—but no indication whatever of the vicinity of rocks or shoals. |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Nov. 30 | 8 A. M. | 31 44 | 51 51 | N. 4° W. | 0.9 | S. S. W. | Fresh. | Cirro Stratus. | 10 | S. W. | 30.06 |
| | 4 P. M. | 31 47 | 51 4 | | | S. S. W. | Fresh. | Cir. Cum. Stratus and Nimbus. | 10 | S. W. | 30.09 |
| Dec. 1 | Midn't. | 31 52 | 50 51 | | | N. N. W. | Light breeze. | Nimbus and Cum. Stratus. | 10 | S. W. | 30.10 |
| | 8 A. M. | 31 59 | 49 48 | | | S. W. | Moderate. | Nimbus and Cirro Cum. Stratus. | 10 | S'd. & W'd. | 30.12 |
| | 4 P. M. | 32 00 | 49.13 | | | S. S. E. | Light breezes. | Nimbus. | 10 | Southward. | 30.12 |
| " 2 | Midn't. | 32 00 | 48 50 | | | S. S. E. | Light breezes. | Nimbus. | 10 | Southward. | 30.12 |
| | 8 A. M. | 32 24 | 48 26 | N. 53° W. | 0.5 | S. E. | Moderate. | Cum. Stratus. | 8 | S'd. & E'd. | 30.22 |
| | 4 P. M. | 32 25 20 | 47 50 | Westward. | 0.5 | South. | Moderate. | Cir. Cum. Strat. | 5 | Southward. | 30.18 |
| " 3 | Midn't. | 32 25 | 47 1 | | | S. by E. | Moderate. | Cum. Stratus. | 6 | Southward. | 30.24 |
| | 8 A. M. | 32 20 | 46 20 | N. 55° E. | 0.5 | Southward. | Light breezes. | Cirro Stratus. | 5 | Southward. | 30.26 |
| | 4 P. M. | 32 31 | 46 4 | Eastward. | 0.5 | South. | Light airs. | Cirro Stratus. | 4 | Southward. | 30.27 |
| " 4 | Midn't. | 32 31 | 45 52 | | | Northward. | Lt. variable airs. | Cir. Strat. & Nim. | 8 | S'd. & E'd. | 30.30 |
| | 8 A. M. | 32 29 40 | 45 44 | S. 45° E. | 0.1 | Southward. | Var. light breezes. | Cum. Stratus. | 5 | S. E. | 30.24 |
| | 4 P. M. | 32 29 30 | 45 20 15 | Eastward. | 0.5 | South. | Light breezes. | Cir. Cum. Strat. | 4 | Southward. | 30.25 |
| " 5 | Midn't. | 32 27 | 44 37 | | | South. | Light breezes. | Cum. Stratus. | 6 | Southward. | 30.15 |
| | 8 A. M. | 32 30 | 43 43 | N. 20° W. | 0.5 | S. by W. | Moderate. | Cum. Stratus. | 5 | Southward. | 30.09 |
| | 4 P. M. | 32 27 | 42 40 | | | S. S. W. | Moderate. | Cumulus. | 3 | Southward. | 30.07 |
| " 6 | Midn't. | 32 20 | 41 44 | | | S. S. W. | Moderate. | Cum. Stratus. | 4 | Stationary. | 30.11 |
| | 8 A. M. | 32 9 | 40 42 | S. 76° E. | 0.2 | S. S. W. | Mod. with squalls. | Cum. Stratus. | 7 | S. S. W. | 30.13 |
| | 4 P. M. | 32 10 30 | 40 13 30 | | | S. W. | Light breezes with squalls. | Cum. Stratus. | 8 | S. W. | 30.14 |
| " 7 | Midn't. | 32 00 | 39 35 30 | | | S. S. W. | Moderate. | Strat. & Nim. | 4 | Southward. | 30.20 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 50 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| o | o | o | o | | | | | |
| 71. | 71. | 71. | 68. | | | | | THURSDAY, NOVEMBER 29th, 1849.—*In search of "Nye's Rock"*—From midnight to 8 a. m., pleasant—At 4 a. m., sounded with 200 fathoms, no bottom; and took temperatures as per column—A long swell from the Southward—8 a. m. to 4 p. m., pleasant—At 9 a. m. sounded with 100 fathoms, no bottom; and took temperatures as per column—At 3.30 p. m., sounded with 100 fathoms, no bottom; and took temperatures as per column—From 4 p. m. to 6 p. m., rainy weather, with squally appearances, and a long swell from N. W.—At 11.30 p. m., sounded with 100 fathoms, no bottom; and took temperatures as per column—Ends pleasant—Passed quantities of sea-weed during this day. |
| 73. | 71. | | | | | | | |
| | | 69.5 | 66.5 | | | | | |
| 69. | 71. | | | | | | | |
| | | 72. | 67 | | | | | |
| 70. | 71. | | | | | | | |
| 72. | 71.5 | 72. | 68 | 7, rippled. | | | | FRIDAY, NOVEMBER 30th, 1849.—Commences, and until 8 a.m., pleasant, with a swell from N. W.—At 8 a. m., sounded for temperatures as per column—8 a. m. to 4 p. m., rainy weather, with squally appearances, and a S. W. swell—At 3 p. m., wind suddenly shifted to N. N. W., with heavy rain—4 p. m. to midnight, squally appearances, with frequent heavy showers of rain—Swell from S. W.—At 10 p. m., sounded for temperatures as per column. |
| 70. | 72. | | | | | | | |
| 70. | 71. | 71. | 67. | | 12° W. | | | SATURDAY, DECEMBER 1st, 1849.—Commences with, and until 8 a. m., rainy weather, with squally appearances—At 6 a. m., took temperatures as per column—8 a. m. to 4 p. m., drizzling rain, with swell from S. W.—From 4 to midnight, rainy, with swell from Southward—At 4, sounded for temperatures as per column—noticed less sea-weed during this day than usual. |
| | | 72. | 67. | 10, slightly rippled. | | | | |
| 75. | 71.3 | | | | | | | |
| 71. | 71. | | | | | | | |
| | | 71.6 | 66.2 | | | | | |
| 70. | 71.2 | | | | 13° W. | | | SUNDAY, DECEMBER 2d, 1849.—Commences with, and until 8 a. m., pleasant, with a swell from the Southward—At 7.30 a. m., sounded for temperatures as per column—From 8 a. m. to 4 p. m., pleasant—At 1.30 p. m., sounded for temperatures as per column—Ends pleasant. |
| 75. | 71.5 | | | | 13° W. | 1029. | | MONDAY, DECEMBER 3d, 1849.—Commences, and until 8 a. m., pleasant, with a swell from the Southward—At 3 a. m., sounded for temperatures as per column—At 8 a. m. to 4 p. m., pleasant—A shower of rain at 10.30—Noticed that there is but very little sea-weed floating past, and that in small detached bunches—From 4 p. m. to midnight, pleasant, with southerly swell—At 6 p. m., sounded for temperatures as per column—At 9.30 p. m., two fin-back whales, and a shoal of porpoises—At 10.50 p. m., wind came E. S. E., with a shower of rain—noticed a brilliant lunar rainbow lasting 20 minutes. |
| | | 71.5 | 66. | | | | | |
| 70. | 71. | | | | | | | |
| 67. | 71. | | | | 14° W. | | | |
| | | | | | | 1028.8 | | TUESDAY, DECEMBER 4th, 1849.—Commences with, and until 8 a. m., pleasant weather—Swell setting from the westward—8 a. m to 4 p. m., pleasant, with a N. W. swell—noticed a few bunches of sea-weed—4 p. m., to midnight, pleasant—At 6 p. m., sounded for temperatures as per column—At 11.30 p. m., sounded for temperatures as per column—Water phosphorescent. |
| 76. | 71. | | | | | | | |
| | | | 65. | | | | | |
| 71. | 70.5 | 70. | 65.5 | | | | | |
| 69. | 70. | 70.5 | 66. | | 16° W. | | | WEDNESDAY, DECEMBER 5th, 1849.—Commences, and until 8 a. m., pleasant, with a long N. W. swell—At 8, sounded for temperatures as per column—Saw a shoal of black fish, albacore and flying fish, and a few bunches of sea-weed—8 a. m. to 4 p. m., pleasant, with a swell from N. W.—At 1 p. m, sounded for temperatures as per column—Threw overboard a "*current bottle*," with date, latitude and longitude, and request to report time and place where picked up—From 4 p. m. to midnight, pleasant, with a W. N. W. swell—At 5.40, sounded for temperatures as per column—At 11, sounded for temperatures as per column. |
| | | 69.5 | 66.5 | 7, rippled. | | | | |
| 73. | 70. | | | | 16° W. | | | |
| | | 69.2 | 65.5 | | | | | |
| 69. | 69.5 | 69. | 65. | | | | | |
| | | 69.5 | 65.5 | | | | | |
| 68. | 69.5 | | | | 17° W. | | | THURSDAY, DECEMBER 6th, 1849.—Commences pleasant—From 4 to 8 a. m., squally—At 3.30 a. m., sounded for temperatures as per column—A swell from the southward—From 8 a. m. to 4 p. m., squally appearances—several squalls of rain—At 10 a. m., sounded for temperatures as per column—Saw a fin-back whale—noticed more sea-weed than yet seen, and in detached bunches—From 4 p. m. to midnight, pleasant—At 3.30, sounded for temperatures as per column—greatest transparency of water yet obtained, being very smooth over the cylinders and perfectly up and down. |
| | | 69. | 65.5 | 10, slightly rippled. | | 1028.8 | | |
| 74. | 69.3 | | | | 17°30'W | 100 fath. | | |
| | | 69. | 64.8 | 15, smooth. | | 1028.8 | | |
| 68. | 69. | | | | | | | FRIDAY, DECEMBER 7th, 1849.—Commenced search for "*Vankeulen's Vigia*"—Commences with squally appearances and rain—At 1 a. m., |
| | | 69. | 65. | | | | | |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per. h. | Direction. | Force. | Winds. | Portion. | Motion from | Bar. |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Dec. 7 | 8 A. M. | 31 49 | 38 58 20 | S. 59° E. | 0.5 | S. S. W. | Moderate. | Cumulus. | 5 | Westward. | 30.13 |
| | 4 P. M. | 31 49 | 38 20 | | | S. by W. | Light breezes. | Cirro Stratus. | 7 | S'd. & W'd. | 30.07 |
| " 8 | Midn't. | 31 41 | 38 13 | | | S. by W. | Var. light breeze. | Stratus. | 4 | S'd. & W'd. | 30.18 |
| | 8 A. M. | 31 42 | 38 12 30 | | | S. S. W. | Mod. with squalls. | Cum. Stratus. | 8 | S. S. W. | 30.09 |
| | 4 P. M. | 31 40 | 37 35 | East. | 0.6 | S. W. | Fresh. | Cir. Cum. Strat. | 8 | S. W. | 30.10 |
| " 9 | Midn't. | 31 41 | 36 27 | | | S. S. W. | Fresh. | Cirro Stratus. | 8 | S. S. W. | 30.00 |
| | 8 A. M. | 31 52 | 35 3 | N. 68° E. | 0.7 | S. S. W. | Fresh. | Cumulo Stratus. | 7 | S. S. W. | 29.96 |
| | 4 P. M. | 31 55 30 | 33 53 30 | Eastward. | 0.5 | S. S. W. | Fresh. | Cirro Stratus. | 9 | S. W. | 29.89 |
| " 10 | Midn't. | 32 7 | 32 45 | | | S. S. W. | Gale. | Cirro Stratus. | 9 | S. S. W. | 29.89 |
| | 8 A. M. | 32 19 20 | 31 33 | | | S. S. W. | Gale. | Cum. Strat. & Nim. | 10 | W. S. W. | 29.88 |
| | 4 P. M. | 32 30 | 30 42 40 | N. 68° E. | 0.5 | S. W. | Fresh with squalls | Cum. Strat. & Nim. | 10 | W. S. W. | 29.90 |
| " 11 | Midn't. | 32 7 | 30 29 | | | W. N. W. | Light breeze. | Cum. Strat. & Nim. | 7 | W. N. W. | 29.98 |
| | 8 A. M. | 31 43 40 | 30 16 | | | N. W. | Light breezes. | Cum. Stratus. | 6 | N'd. & W'd. | 30.03 |
| | 4 P. M. | 31 18 | 29 46 | Eastward. | 0.7 | W. | Light breezes. | Cirro Cumulus. | 7 | W. N. W. | 30.02 |
| " 12 | Midn't. | 30 39 | 28 48 | | | W. S. W. | Moderate. | Cumulo Stratus. | 6 | W. N. W. | 30.07 |
| | 8 A. M. | 30 11 40 | 28 19 | S. 62° E. | 1.5 | West. | Moderate. | Stratus. | 4 | W. N. W. | 30.01 |
| | 4 P. M. | 30 11 30 | 27 30 | Eastward. | 0.4 | West. | Moderate. | Cir. Cumulo. | 7 | Westward. | 30.00 |
| " 13 | Midn't. | 30 35 30 | 26 56 30 | | | W. N. W. | Moderate. | Cir. Cum. Stra. | 9 | Westward. | 30.02 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | Water. Surface. | Water. 50 fath's | Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| o | o | o | o | | | | | |
| 67. | 69. | 70. | 63. | 10, slightly rippled. | 17° W. | | | sounded for temperatures as per column—From 8 a. m. to 4 p. m., pleasant, with a swell from N. W.—Passed a quantity of sea-weed—At 9 a. m., sounded for temperatures as per column—Passed through two long lines of sea-weed, in parallel lines, stretching N. E. and S. W., and numerous detached bunches—From 4 p. m. to midnight, pleasant—At 5.30 p. m. to 7 p. m., employed sounding, 500 fathoms up and down, and no bottom, and took temperatures as per column—(Position of this sounding, Latitude 31°39′ N., Longitude 38°17′W.)—Some swell from the N. W.—Hove to for the night—At midnight sounded with 100 fathoms, no bottom—and took temperatures as per column—Saw no indication whatever of a rock or shoal during this day. |
| 74. | 70. | 69. | 67.5 | | | | | |
| | | | 500 fath's. | | | | 500 | |
| | | | 59° | | | | | |
| 68. | 68.7 | 67. | 63. | | | | | |
| | | 67. | 63.5 | | | | | |
| | | 67. | 63.5 | | | | | |
| 68. | 68. | | | | | Surface | | SATURDAY, DECEMBER 8th, 1849.—In search for "*Vankeulen's Vigia*"—Commences pleasant—At 6.30 a. m., made all sail by the wind—At 2 a. m., and at 4 a. m., sounded with 100 fathoms, no bottom—and took temperatures as per column—From 8 to 10 a. m., squally—At 11 a. m., sounded with 300 fathoms, no bottom, up and down—and took temperatures as per column—(Position of this sounding, Latitude 31°40′ N., Longitude 38°7′ W.)—Meridian to 4 p. m., pleasant—swell from the S. W.—From 3 to 4.30 p. m., employed sounding with 500 fathoms, and no bottom—Position of this sounding as per column—Cylinders at 100 and 300 fathoms came up filled with surface water—(so much drift to leeward in hauling up the line, and the cylinders being consequently so much inclined from the perpendicular, the valves worked open; this often happens, particularly with these extra-deep soundings)—At 4.30 p. m., made sail—From 6 to midnight, fresh with S. W. swell and very damp atmosphere—Passed during the day a quantity of sea-weed in small patches, arranged in parallel lines in the direction of the wind—Beat about during this day in various directions over and in the vicinity of the assigned position of "Vankeulen's Vigia," but could find no indication whatever of *rocks or shoals.* |
| | | | 300 fath's. | | | 1028.6 | 300 | |
| | | 69. | | | | 200 fath. | | |
| | | | 67.5 | | | 1028.4 | | |
| | | | | | | 500 fath. | | |
| 73. | 69. | 69. | | 4, much rippled. | | 1028.2 | 500 | |
| 70. | 69. | | | | | | | |
| 69. | 69.5 | 70. | | 3, much rippled. | | | | |
| 73. | 70. | | | | | | | SUNDAY, DECEMBER 9th, 1849.—Commences and until 8 a. m. fresh with a S. W. swell—From 8 a. m. to 4 p. m. a heavy sea running from S. W.—At 9 a. m. sounded for temperatures—Cylinder, at 100 fathoms, came up filled with surface water—Passed quantities of sea-weed—From 4 p. m. to 8 p. m. bad weather, with heavy sea—Lightning to the Northward and Eastward—From 8 to midnight frequent heavy squalls with rain—Ends unpleasant, with heavy sea running from S. W. |
| 70. | 70. | | | | | | | |
| 66. | 69.5 | | | | | | | |
| 69. | 68.5 | | | | | | | MONDAY, DECEMBER 10th, 1849.—Commences with heavy squalls and rain—From 8 a. m. to 4 p. m. occasional severe squalls with heavy rain—A heavy sea running from S. W.—passed a *few bunches* of sea-weed—From 4 to 6 p. m. pleasant—Passed less sea-weed than usual—6 to midnight, pleasant, with squally appearances at N. W. and heavy swell from Westward. |
| 67. | 68. | 68. | 66. | | | | | |
| 66. | 68.5 | | | | 19°30′W | | | TUESDAY, DECEMBER 11th, 1849.—Commences pleasant—At midnight sounded for temperatures as per column—From 4 to 8 a. m, passed much sea-weed—8 a. m. to 4 p. m. pleasant—At 9, sounded for temperatures as per column—Passed lines of sea-weed running N. W. and S. E.—A long regular swell setting from N.W.—From 4 to midnight, pleasant—At 5 sounded for temperatures, as per column—At 9 p. m. sounded for temperatures, as per column—passed much sea-weed. |
| | | 68. | 66. | | | | | |
| 69. | 69.5 | | | | | | | |
| | | 70. | 64. | 5, rippled. | | | | |
| 66. | 69.5 | 69.5 | 66. | | | | | WEDNESDAY, DECEMBER 12th, 1849.—Midnight to 8 a. m. pleasant—Water phosphorescent; at 4 sounded for temperatures, as per column—*No sea-weed seen*—Swell from the N. W.—8 a. m. to 4 p. m. pleasant, with a N. W. swell—At 9 sounded for temperatures, as per column, —At 4 sounded for temperatures with 300 fathoms line, as per column—No sea-weed—4 p. m. to midnight pleasant, with a long regular swell from the N. W.—At 10 p. m. sounded for temperatures, as per column—Water phosphorescent—No sea-weed seen during this day, though in the region of the Sargasso sea. |
| | | 67. | 63.5 | | | | | |
| 67. | 69.5 | | | | | | | |
| | | 70. | 65.5 | | | | | |
| | | | 300 fath's. | | | | | |
| 72. | 70. | 69.5 | 57° | | 22° W. | 1028.8 | | THURSDAY, DECEMBER 13th, 1849.—Midnight to 8 a. m. pleasant—At 5, sounded for temperatures, as per column—Saw no gulf-weed—8 a. m. to 4. p. m. pleasant—No sea-weed—At 11.30 sounded for temperatures, as per column—A long, regular and heavy swell from N. W. —From 4 p. m. to 6 p. m. pleasant, saw no gulf-weed—6 p. m. to mid- |
| 69.5 | 69.5 | 69.5 | 69. | | | | | |
| | | 68.5 | 67. | | | | | |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Dec. 13 | 8 A. M. | 30 55 | 26 24 | S. 35° E. | 0.4 | West. | Moderate. | Strat. and Cum's. | 10 | N'd. & W'd. | 30.03 |
| | 4 P. M. | 31 20 | 25 36 | Eastward. | 0.4 | S. W. | Moderate. | Cir. Cum. Stra. | 8 | W. S. W. | 30.15 |
| " 14 | Midn't. | 31 35 | 24 40 30 | | | S. S. W. | Moderate. | Stratus. | 4 | S. S. W. | 30.13 |
| | 8 A. M. | 31 35 30 | 24 14 | N. 55° E. | 0.3 | S. W. | Moderate. | Cumulus. | 7 | S. W. | 30.15 |
| | 4 P. M. | 31 39 30 | 23 42 30 | Eastward. | 0.4 | S. S. W. | Moderate. | Cir. Cum. Stra. & Nimbus. | 8 | S. W. | 30.18 |
| " 15 | Midn't. | 31 43 | 23 46 | | | S. W. by W. | Very light breezes | Clear. | 0 | | 30.22 |
| | 8 A. M. | 31 52 30 | 23 58 30 | N. 32° W. | 0.5 | S. W. | Light airs. | Cum. Stratus. | 2 | S. W. | 30.25 |
| | 4 P. M. | 31 46 40 | 24 3 | Westward. | 1.4 | S. S. W. | Light airs. | Cir. Cum. Stra. | 2 | Stationary. | 30.23 |
| " 16 | Midn't. | 31 45 | 23 57 | | | | Calm. | Stratus. | 1 | Stationary. | 30.27 |
| | 8 A. M. | 31 36 30 | 24 14 | S. 86° W. | 1.2 | S'd. & E'd. | Lt. variable airs. | Cirro Stratus. | 6 | Eastward. | 30.24 |
| | 4 P. M. | 31 43 | 23 56 30 | Westward. | 0.4 | E. S. E. | Light breezes. | Cir. Cum. Stratus & Nimbus | 9 | Eastward. | 30.27 |
| " 17 | Midn't. | 31 49 | 23 49 | | | S. E. | Mod. & squally. | Cum. Stratus. | 8 | S. E. | 30.20 |
| | 8 A. M. | 31 47 40 | 23 45 | | | S. E. | Moderate. | Cum. Stratus & Nimbus. | 10 | S. E. | 30.14 |
| | 4 P. M. | 31 47 | 23 8 | | | S. by W. | Moderate. | Nimbus. | 10 | Southward. | 30.10 |
| " 18 | Midn't. | 32 00 | 22 18 40 | | | S. by W. | Fresh. | Cum. Stratus. | 7 | Southward. | 30.09 |
| | 8 A. M. | 32 21 20 | 21 47 | N. 16° E. | 0.8 | S. by E. | Fresh. | Cum Stratus & Nimbus. | 8 | Southward. | 30.05 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 50 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 68. | 69.5 | | | | | | | night pleasant—At 8, sounded with 200 fathoms line, no bottom, and temperatures as per column—approaching the assigned position of "*Josyna Rock*,"—at 10 p. m. hove to for the night, on the starboard tack. |
| | | 69. | 68. | 5, rippled. | | | | |
| 74. | 69.5 | | | | 20°15′W | | | FRIDAY, DECEMBER 14th, 1849.—*Commenced search for "Josyna Rock."*— |
| | | | | | | | 200 | From midnight to 8 a. m pleasant—At 5 30, filled away and made |
| | | 69.5 | 68.5 | | | | | sail—At 2, sounded, as per column—No sea-weed—8 a. m. to 4 p m |
| 68. | 69. | 68.5 | 66. | | | | | pleasant—one small bunch of sea-weed seen—From 4 p. m. to mid- |
| | | | | | | | | night, pleasant—A long N. W. swell—At 5.50 p. m., hove to for |
| 68. | 68.5 | | | | 21°40′W | | | sounding—Sounded with 500 fathoms line, up and down, and no bot- |
| | | | | | | | | tom—Temperatures as per column—The cylinder at 400 fathoms, |
| 75. | 67.8 | | | | | | | and Six's thermometer at 450 fathoms, came up out of order—Saw |
| | | 67.5 | 66.5 | | | 1023.7 | 500 | during the day no indication whatever of *Rock* or *Shoal*—At 7 p. m. |
| | | | 500 fath's. | | | 500fath's | | hove to for the night. |
| | | | 62° | | | 1028.8 | | SATURDAY, DECEMBER 15th, 1849.—In search of "*Josyna Rock*"—Com- |
| 68. | 67.5 | | | | | | | mences pleasant, with long, regular and heavy swell from N. W.—At |
| | | | | | | | | midnight, sounded with 100 fathoms, no bottom, and temperatures as |
| 67. | 67.5 | | 500 fath's. | | 23°20′W | | | per column—At 6 filled away and made sail—8 a. m. to 4 p. m. plea- |
| | | | 57° | | | | | sant—At 10.30, lowered a boat and tried current; found no surface |
| | | | 300 fath's. | | | | | current—Our heavy sounding lines would not answer for trying under |
| | | | 63° | | | | | current; made several trials but without success—From 4 p. m. to mid- |
| | | 70 fs | 130 fath's. | | | | | night pleasant—From 6 to 8, sounded with 500 fathoms, no bottom; |
| 74. | 68. | 67. | 66° | | | | 500 | temperatures as per column—No sea-weed seen during the day, nor |
| 66. | 68. | 66. | | | | | | any indication whatever of rock or shoal. |
| | | | | | | | | SUNDAY, DECEMBER 16th, 1849.—*In search of Josyna Rock.*—Commences, |
| 65. | 67. | | | | 22°15′W | | | and until 8 a. m., pleasant—At midnight, sounded with 100 fathoms, |
| | | | | | | | | no bottom—temperatures as per column—At daylight made all sail |
| 68. | 67. | | | | | | | by the wind—a long swell from the N. W.—A sea-gull and several |
| | | | 500 fath's. | | | | | petrels seen—8 a. m. to 4 p. m. pleasant—At 11, one small *sprig of* |
| | | 67. | 61° | | | | 500 | *sea-weed seen*—4 p. m. to 6 p. m. squally appearances, with rain—at |
| 66. | 67. | | | | | | | 5.40, hove to for the night—6 p. m. to 8 p. m. employed sounding |
| | | 66. | 65. | | | | | with 500 fathoms, found no bottom—temperatures as per column— |
| 66. | 67. | | | | | | | The Six's thermometer at 300 fathoms came up out of order, and the |
| | | | | | | | | wooden cylinder at 100 fathoms came up empty—From 6 to mid- |
| 67. | 67. | 67. | 66. | | | | 300 | night, damp weather with long, irregular swell from N. W. and |
| | | 67. | 66. | | | | 200 | lightning to the Eastward—Saw no indication whatever of a rock or |
| | | | 200 fath's. | | | | | shoal during this day. |
| | | | 63.5 | | | | | MONDAY, DECEMBER 17th, 1849.—*In search of Josyna Rock.*—Commences |
| 67. | 67.5 | | | | | | | with, and until 8 a. m., squally appearances, with occasional light |
| | | 67. | 66. | | | | | rain—At 2, sounded with 100 fathoms, no bottom—temperatures as |
| | | 67. | 66. | | | | | per column—At daylight filled away and made sail—A long N. W. |
| 66. | 67.5 | | | | | | | swell, with a short counter sea from Southward—8 a. m. to 4 p. m. |
| | | | | | | | | unpleasant, with rain—At 3.30 p. m. sounded with 300 fathoms, no |
| | | | | | | | | bottom—temperatures as per column—Six's thermometer at 300 |
| | | | | | | | | fathoms came up out of order, the markers having penetrated the |
| | | | | | | | | mercury—4 p. m. to midnight unpleasant, with long N. W. swell— |
| | | | | | | | | At 8.30, sounded with 200 fathoms, no bottom—temperatures as per |
| | | | | | | | | column—Saw no indication whatever of a rock or shoal during the |
| | | | | | | | | day. |
| | | | | | | | | TUESDAY, DECEMBER 18th, 1849.—*Commenced search for "Steen Ground."* |
| | | | | | | | | Commences with, and until 8 a. m., cool and damp, with swell from |
| | | | | | | | | the Southward—From 3 till daylight hove to—At 1, sounded with |
| | | | | | | | | 100 fathoms, no bottom, and temperatures as per column—At 4, |
| | | | | | | | | sounded with 100 fathoms, no bottom, and temperatures as per column |
| | | | | | | | | —At daylight filled away for *Steen Ground*—8 a. m. to 4 p. m. a |
| | | | | | | | | heavy swell from the Southward—At 2 30 our position thoroughly |
| | | | | | | | | determined by a number of sets of observations both for Latitude |
| | | | | | | | | and Longitude, being in the immediate vicinity of the assigned posi- |
| | | | | | | | | tion of "*Steen Ground*" (having passed over the centre of it with no |
| | | | | | | | | indication whatever of a shoal), hove to and sounded with 500 |
| | | | | | | | | fathoms line and found no bottom—(Position of this sounding, Lati- |
| | | | | | | | | tude 32° 23′ N., Longitude 21° 10′ W.)—temperatures as per column |
| | | | | | | | | —Threw overboard a "*Current bottle*," enclosing a paper with our |
| | | | | | | | | date and position, with request to the finder to report the time and |
| | | | | | | | | place where found to Lieut. Maury, Superintendent, National Obser- |



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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Dec. 18 | 4 P. M | 32 27 | 21 6 40 | | | E. S. E. | Fresh. | Cir. Cum. Strat. | 8 | Southward. | 29.98 |
| " 19 | Midn't. | 32 29 20 | 21 3 | | | E. S. E. | Gale. | Cir. Cum. Strat. & Nimbus. | 9 | Southward. | 29.99 |
| | 8 A. M. | 32 30 30 | 21 3 | | | S. by W. | Gale. | Cum. & Nimbus. | 10 | S. S. W. | 29.97 |
| | 4 P. M. | 32 36 | 20 58 | | | S. S. W. | Gale. | Cum. Stratus & Nimbus. | 10 | S. & N. | 29.96 |
| " 20 | Midn't. | 32 41 | 20 50 | | | S. S. W. | Fresh, with sq'lls. | Cum. Stratus. | 7 | S'd. & W'd. | 29.97 |
| | 8 A. M. | 32 41 | 20 6 | | | W. S. W. | Fresh & squally. | Cum. Stratus & Nimbus. | 8 | W. S. W. & W. N. W. | 30.00 |
| | 4 P. M. | 32 1 | 19 39 40 | South. | 0.8 | S. W. by W. | Fresh, with sq'lls. | Cum. Stratus. | 7 | W. S. W. | 30.04 |
| " 21 | Midn't. | 31 34 | 19 22 | | | W. S. W. | Light breezes. | Cir. Cum. Strat. | 6 | W. S. W. | 30.06 |
| | 8 A. M. | 31 19 | 19 3 20 | Eastward. | 0.5 | W. S. W. | Light airs. | Cum. Strat. | 6 | W. S. W. | 30.03 |
| | 4 P. M. | 30 55 30 | 18 42 | Eastward. | 0.8 | W. by N. | Light breezes. | Cum. Strat. | 7 | Westward. | 30.02 |
| " 22 | Midn't. | 30 54 40 | 18 41 20 | | | | Calm. | Cir. Cum. Strat. | 5 | N'd. & E'd. | 30.03 |
| | 8 A. M. | 30 41 40 | 18 44 30 | S. 43° W. | 0.6 | East. | Light airs. | Cumulus. | 7 | Eastward. | 29.97 |
| | 4 P. M. | 30 22 30 | 18 43 40 | Westward. | 0.3 | S. E. | Light breezes. | Cum. Stratus. | 9 | S'd. & E'd. | 30.01 |
| " 23 | Midn't. | 20 22 | 18 25 40 | | | S. E. | Moderate. | Cir. Cum. Strat. | 7 | S. E. | 29.98 |
| | 8 A. M. | 30 17 45 | 17 53 | S. 35° E. | 0.5 | S. S. E. | Moderate. | Cir. Cum. Strat. | 8 | S'd. & E'd. N'd. & W'd. See remarks. | 29.93 |
| | 4 P. M. | 29 59 | 17 49 | | | S. S. E. | Moderate. | Cir. Cum. Strat. | 9 | Cir. fr. N. W. Cum. fr. S. E. Stra. station'y | 29.89 |
| " 24 | Midn't. | 29 32 | 17 50 | | | S. E. | Moderate. | Cir. Cum. Strat. | 9 | Cir. N. W. Cum. S. E. Stra. station'y | 29.87 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | Water. Surface. | Water. 50 fath's | Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | | | | | | |
| 69. | 68. | 68. | 67° | 3, much rippled. | | 1028.8 | 500 | vatory, &c.—At 4, filled away—From 4 p. m. to 6 p. m. wind freshening, with stormy appearances—barometer falling, and heavy sea from Southward—At 5, hove to on starboard tack and prepared for a gale—6 p. m. to midnight, damp unpleasant weather, with frequent squalls and heavy sea—At 8, sounded with 100 fathoms, no bottom—At midnight, sounded with 120 fathoms, and no bottom—too much sea for temperatures. |
| | | | 200 fath's. | | | 300fath's | | |
| | | | 65° | | | 1028.9 | | |
| | | | 500 fath's. | | | 500fath's | | |
| | | | 61° | | | 1029.1 | | |
| 66. | 68. | | | | | | 120 | WEDNESDAY, DECEMBER 19th, 1849.—Commences with stormy weather, hard squalls and lightning to the Southward—At 4 a. m. sounded with 120 fathoms, no bottom—a heavy head sea—meridian to 4 p. m. tempestuous weather—At 1, became suddenly very thick and dark, when wind suddenly flew round to N. N. W. in a very heavy squall, accompanied with heavy thunder, lightning, and rain in torrents—Barometer at time of shift of wind 29.93—At 4 p. m. variable light breezes, with squally appearances and heavy sea running—lightning to the Northward—At 5, wind veered again to the Southward—At 8 p. m. sounded with 120 fathoms, no bottom—8 to midnight, heavy squalls, attended with lightning to the Northward. |
| 67. | 68. | | | | | | | |
| 68. | 67.5 | | | | | | | |
| | | 66.5 | 65.5 | | | | | |
| 65. | 66.5 | | | | | | | THURSDAY, DECEMBER 20th, 1849.—Commences with, and until 8 a. m., squally, with rain in heavy showers—lightning to the Southward and Westward, and to the Southward and Eastward, irregular cross sea—At daylight made more sail and filled away—From 8 a. m. to 4 p. m. pleasant—At 1, sounded with 100 fathoms; temperatures as per column—At 2, a squall from S. W. with rain—4 p. m. to midnight, pleasant, with a Westerly swell—At 8.30, sounded with 100 fathoms—temperatures as per column. |
| 64. | 67. | | | | | | | |
| | | 67.5 | 63.5 | | | | | |
| 68. | 67. | | | 5, much rippled. | 22°40'W | | | |
| | | 67.5 | 65. | | | | | FRIDAY, DECEMBER 21st, 1849.—Commences, and until 8, a. m., pleasant—At 6, sounded for temperatures as per column—8 a. m. to 4 p. m. pleasant, with occasional showers of light rain—Saw many shoals of porpoises, rudder fish and gar fish, and much *whale feed*—At 1.45 p. m. saw a large shoal of *sperm whales*, over 100, moving in a N. E. direction—Porpoises going the same direction—From 4 to midnight, calm and pleasant—At 7 p. m. sounded for temperatures as per column. |
| 66. | 68. | | | | | | | |
| | | 67.5 | 66. | | | | | |
| 65. | 68. | | | | 21°20'W | | | |
| 72. | 68. | | | | | | | SATURDAY, DECEMBER 22d, 1849.—Commences with, and until 8 a. m., pleasant, with squally appearances—At 6, saw a flock of *gulls*—8 a. m. to 4 p. m. pleasant, with a long N. W. swell—At 3, sounded for temperatures as per column—From 4 p. m. to midnight, pleasant, with a slight N. W. swell—A "halo" round the Moon—At 11.40, sounded for temperatures as per column. |
| | | 68. | 65. | | | | | |
| 65. | 68.5 | | | | | | | |
| 66. | 68. | | | | 18°30'W | | | |
| | | | | | | Surface. | | SUNDAY, DECEMBER 23, 1849.—Commences with, and until 8 a. m., pleasant weather—A long regular swell from N. W.—Clouds were moving in opposite directions—the upper strata "*Cirri*" from N. W., and lower strata "*Cumuli*" from E. S. E., "*Strati*" stationary about the horizon—Shoal of porpoises playing about us—From 8 a. m. to 4 p. m.. pleasant—At 9.40, sounded as per column—Saw a fish-hawk and a flock of sea-gulls—From 4 p. m. to midnight, pleasant—At 4.30, made the Island of Palma, (Canaries,) bearing per compass S. S. W., distant 67 miles—At 4.40, sounded for temperatures as per column—Clouds observed to move in opposite directions as per column—At 5.30, center of Palma bore per compass S. 20° W.—A long swell from N. W., and a short head sea from the Eastward—At midnight, Island of Palma in sight—Observed an unusual bright and strongly defined "halo" around the Moon—At 11.30, sounded for temperatures as per column—Lightning to the Westward. |
| | | | | | | 1028.4 | | |
| | | | | | | 100fath's | | |
| 70. | 68.5 | 63.5 | 63.5 | 6, much rippled. | | 1028.7 | | |
| 65. | 68.5 | 66.5 | 63.5 | | | | | |
| 65. | 68.5 | 67.5 | 65. | | 19°32'W | | | |
| 68. | 68.2 | 68. | 65. | 5, much rippled. | | | | MONDAY, DECEMBER 24th, 1849.—Commences with, and until 8 a. m., pleasant—first part, squally appearances to N. E. and lightning from W. to N.—A long regular swell from N. W., and a short head sea (from Eastward)—At daylight, made the Island of Teneriffe, bearing per compass S. W. by S. ½ S.—At 6.30, made the Island of "*Gomera*," bearing per compass S. ½ E.—From 8 a. m. to 4 p. m., pleasant—At 9, East end of Island of Palma bore per compass S. 20° W., West point S. 43° W.—At 11, sounded for temperatures—In hauling up, the line parted, and the two large metal cylinders, 2 wooden cylinders, and one Erickson's patent lead, were lost. (N. B. This is a serious misfortune, and I fear an irreparable one, especially the metal |
| 66. | 68. | 68. | 65. | | | | | |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h'r. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Dec. 24 | 8 A. M. | 29 16 30 | 17 47 50 | S. 45° W. | 0.75 | S. S. E. | Light breezes. | Cirro Stratus. | 8 | N'd. & E'd. | 29.83 |
| | 4 P. M. | 29 9 | 17 37 10 | S. 16° W. | 0.4 | S. E. by S. | Light breezes. | Cir. Cum. Strat. | 7 | S. E. | 29.87 |
| " 25 | Midn't. | 29 9 | 17 22 30 | | - | S. E. by E. | Light breezes. | Cum. Stratus. | 5 | E. S. E. | 29.85 |
| | 8 A. M. | 29 13 45 | 17 11 10 | N. 33° W. | 0.3 | E. S. E. | Ga'e. | Cumulus. | 8 | Eastward. | 29.87 |
| | 4 P. M. | 28 47 30 | 17 10 | | | East. | Fresh. | Cir. Cum. Strat. | 10 | Eastward. | 29.92 |
| " 26 | Midn't. | 29 6 | 16 57 25 | | | E. S. E. | Gale. | Cum. & Nimbus. | 10 | N'd. & E'd. | 29.97 |
| | 8 A. M. | 29 17 | 17 5 | N. 57° W. | 0.3 | E. S. E. | Gale. | Nim.&Cum.Strat. | 10 | S'd. & E'd. | 29.95 |
| | 4 P. M. | 29 1 | 17 10 50 | | | E. by S. | Gale. | Cum. Stratus. | 10 | E. S. E. | 30.02 |
| " 27 | Midn't. | 29 12 30 | 17 16 30 | | | East. | Gale. | Cir. Cum. Strat. | 9 | Cir. N. W. Cum. E. S. E. | 30.07 |
| | 8 A. M. | 28 50 | 16 47 30 | S. 84° E. | 1.4 | E. by S. | Fresh with squalls. | Cir. Cum. Strat. | 8 | Cir. N. W. Cm.St. E.S.E | 30.10 |
| | 4 P. M. | 28 49 30 | 16 28 40 | Eastward. | 1.4 | E. by S. | Gale. | Cir. Cum. Strat. | 7 | Eastward. | 30.12 |
| " 28 | Midn't. | 29 7 | 16 32 | | | E. by S. | Fresh with squalls. | Cum. Stratus. | 8 | S'd. & E'd. and N. W. | 30.10 |
| | 8 A. M | 29 1 | 16 15 | N. 69° E. | 1.0 | S. E. by E. | Mod. with squalls. | Cir. Cum. Strat. | 8 | Eastward. | 30.12 |
| | 4 P. M. | 28 51 | 16 3 | N. 33° E. | 1.5 | S. E. by E. | Mod. with squalls. | Cir. Cum. Strat. | 9 | Eastward. | 30.08 |
| " 29 | Midn't. | At anch town of Cruz, "T | or off the Santa eneriffe " | | | S. E. | Moderate. | Cir. Cum. Strat. | 6 | S'd. & E'd and W'd. | 30.01 |
| | 8 A. M. | | | | | | | | | | |
| | 4 P. M. | | | | | | | | | | |
| 1850. Jan. 6 | Midn't. | At | Anchor, Roa | dstead of Santa C | ruz. | | | | | | |
| | 8 A. M. | | | | | | | | | | |
| | 4 P. M. | | | | | | | | | | |
| " 7 | Midn't. | | | | | | | | | | |
| | 4 A. M. | Got und | erway. | | | N. E. | Moderate. | | | | |
| | 8 A. M. | N. 28°17'by Bearing & angles. | W. 16°10'by Bearing & angles. | | | N. E. | Moderate. | Cumulus. | 7 | N. E. | 30.29 |
| | 4 P. M. | 27 22 | 16 38 30 | West. | 0.5 | N. E. by E. | Fresh. | Cum Stratus. | 6 | N E. | 30.24 |
| " 8 | Midn't. | 26 38 30 | 17 4 30 | | | N. E. | Moderate. | Cum. Stratus. | 5 | N. & E. | 30.23 |
| | 8 A. M. | 25 44 | 17 26 50 | S. 10° E. | 0.7 | E. N. E. | Moderate. | Cumulus. | 8 | N. E. | 30.19 |
| | 4 P. M. | 24 59 | 18 00 30 | S. 60 W. | 1.0 | E. N. E. | Moderate. | Cir. Cum. Strat. | 7 | N. E. | 30.15 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | Water. Surface. | Water. 50 fath's | Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep-sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 65. | 68. | | 66. min. | 5, much rippled. | | | | cylinders, which could always be relied upon to come up full of water, and I had ascertained by many experiments, the correction to allow for change of temperature in coming up from the various depths. They were the only two metal cylinders we had, and the two wooden ones lost, were fitted with the best valves, in fact the only ones that would work with any correctness, the upper valves of the others having proved worthless. One only chance is to get new ones at Santa-Cruz, where we are now bound. Only one Six's thermometer remains good, the pointers of the others having penetrated the Mercury, and the Mercury cannot be got from above the pointers or markers. This misfortune is to be ascribed entirely to the poor stuff furnished us at New York Navy Yard, for deep sea sounding lines—At 1 p. m., sounded, and took temperatures as per column, with the *Syx's thermometer*—the maximum pointer had penetrated the Mercury—the minimum was all right—At 3.30 p. m., East point of Palma bore per compass S. 33° W., West point S. 56° W., and Peak of Teneriffe S. 22° East—Ends with a long swell from N. N. E. |
| 69. | 68. | | | | | | | |
| 65. | 68. | | | | | | | |
| 64. | 67.5 | | | | | | | |
| 66. | 68. | | | | | | | |
| 64. | 68. | | | | | | | |
| 62. | 67.5 | | | | | | | |
| 64. | 67.5 | | | | | | | |
| 63. | 67. | | | | | | | |
| 62.5 | 67. | | | | | | | |
| 65. | 67. | | | | | | | TUESDAY, DECEMBER 25th, 1849—During this day, cool, unpleasant, squally weather, latter part with rain—A heavy sea running from the Eastward—At 4 p. m., the peak of Teneriffe bore per compass S. 12° E.—At 9 p. m., hove to—blowing a gale, with heavy head sea. |
| 62. | 67. | | | | | | | WEDNESDAY, DECEMBER 26th, 1849.—Commences with, and until 8 a. m., unpleasant, with rain and heavy head sea—At 7.40 a. m., wore ship and made more sail—At meridian, Point Teno, (Island of Teneriffe,) bore per compass S. 12° W.—(Filled some empty water casks with salt water to trim ship, finding she made so much lee-way—At 2) p. m., Point Teno bore per compass S. 22° W.—Peak of Teneriffe, due South—From 6 to 8 p. m., more moderate weather, but heavy sea running from the Eastward—A "*Corona*" round the Moon—(Wood and water being low, reduced expenditures to half-allowance of wood, and water to 3 quarts per man). |
| 62. | 66.8 | | | | | | | |
| 64. | 67. | | | | | | | |
| 63. | 66.8 | | | | | | | THURSDAY, DECEMBER 27th, 1849.—During this day, squally, unpleasant weather, with heavy head sea (from the Eastward)—At 7 a. m., Point Teno bore per compass S. 38° W.—Peak of Teneriffe S. 21° W., and Point Anaga S. 43° E.—Beating to windward to weather Point Anaga. |
| | | | | | | | | FRIDAY, DECEMBER 28th, 1849.—Commences with, and until 8 a. m., pleasant, with heavy head sea—At 6.30 a. m., Point Anaga bore per compass S. 3° W.—At noon Point Anaga bore per compass S. 2° W., and Peak of Teneriffe S. 62° W.—At 5 p. m., Island of Grand Canarie in sight on weather bow—At 6 p. m., Point Antiquerra bore per compass S. W. by W. ½ W.—From 6 to midnight, pleasant weather, with a S. E swell—At 8 p. m., Point Anaga bore per compass N. N. E.—At 8, lights in sight, bearing per compass W. by S.—From 8 to midnight, standing in along shore for the anchorage at Santa Cruz—At midnight, came to anchor off the town of Santa Cruz, in 20 fathoms water—Steeple of San Francisco church, bearing per compass N. 50° W.—Steeple of Conception Church N. 80° W. |
| | | | | | | | | SUNDAY, JANUARY 6th, 1850.—At anchor—Roadstead of Santa Cruz. |
| | | | | | | | | MONDAY, JANUARY 7th, 1850.—Commences light breezes, and pleasant—At 4 a. m. weighed and stood off the coast—At 5.30 a. m. hove to—waiting for daylight to get angles and bearings for point of departure—At 7, took the following bearings and kept away—N. E. point of Grand Canarie Island, S. 48° E.—South point, S. 18° E. Peak of Teneriffe, N. 84° W.—Point Antiquerra (Island Teneriffe), N. 33° East, and Church of Conception (Santa Cruz), N. 12° W. and dist. 8 miles—From 8 a. m. to 4 p. m. pleasant—At 3 30 p. m., Peak of Tenerife bore, per compass, N. 20° E.—at 4, hove to, to sound for temperatures as per column—A heavy sea running from N. E—ends pleasant. |
| 63. | 66. | | | | | | | |
| 65. | 66. | 64.5 | 63. | 4, much rippled. | | | | |
| 63. | 66.3 | | | | | | | |
| 64. | 66.8 | | | | | | | |
| 67. | 67. | | 63. | 7, rippled. | | | | TUESDAY, JANUARY 8th, 1850.—Commences with, and until 8 a. m. pleasant, with a heavy sea from N'd. & E'd.—8 a. m. to 4 p. m. pleasant—At 1, sounded for temperatures as per column (too much sea for getting temperatures from depths to be depended upon as correct)—From 4 p. m. to midnight, pleasant—At 5.40 sounded for tempera- |
| 67. | 67. | | | | 20°21'W | | | |
| | 67. | 65.5 | 63.5 | | | | | |
| | 67. | | 64. | | | | | |



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| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Jan. 9 | Midn't. | 24 19 | 18 31 30 | | | E. by W. | Fresh. | Cum. Stratus & Nimbus. | 3 | Eastward. | 30.14 |
| | 8 A. M. | 23 18 30 | 19 16 | S. 28° W. | 0.8 | N. E. by E. | Moderate. | Cum. & Stratus. | 4 | N. E. | 30.11 |
| | 4 P. M. | 22 35 | 19 38 20 | | | E. N. E. | Fresh. | Cumulus. | 4 | N. E. | 30.07 |
| " 10 | Midn't. | 21 33 | 19 45 30 | | | E. N. E. varying from N.E to E.S.E. | Fresh, with sq'lls. | Cum. Stratus & Nimbus. | 7 | E. N. E. | 30.06 |
| | 8 A. M. | 20 29 | 20 13 | S. 67 W. | 1.2 | E. S. E. | Mod.,with squ'lls. | Cum. Stratus & Nimbus. | 4 | N'd. & E'd. | 30.03 |
| | 4 P. M. | 19 50 30 | | Westerly. | 0.7 | E. S. E. | Fresh. | Cir. Cum. Strat. | 8 | Cum. Strat. from E. by N. Cirrus from W. N.W | 29.99 |
| | 6 P. M. | 19 42 40 position ing about Roc | 20 31 30 of sound- "Maria k." | | | | | | | | |
| " 11 | Midn't. | 19 44 | 20 34 30 | | | East. | Moderate. | Cum. Stratus. | 3 | N'd. & E'd. | 30.02 |
| | 8 A. M. | 19 30 40 | 20 59 | S. 70° W. | 1.0 | E. by S. | Fresh. | Cum. Stratus. | 4 | Eastward. | 29.93 |
| | Noon. | 19 47 30 | 21 13 | | | | | | | | |
| | 4 P. M. | 19 25 | 21 22 | Westerly. | 0.8 | East. | Fresh. | Cumulus. | 5 | Eastward. | 29.94 |
| " 12 | Midn't. | 18 23 40 | 21 18 30 | | | East. | Fresh. | Cumulus. | 3 | East. | 29.97 |
| | 8 A. M. | 17 18 30 | 21 28 | S. 63° W. | 0.8 | E. N. E. | Moderate. | Cir. Cum. Strat. | 7 | N'd. & E'd. | 29.96 |
| | Noon. | 16 48 00 | 21 26 00 | | | | | | | | |
| | 3 P. M. | 16 23 | 21 15 | | | | | | | | |
| | 4 P. M. | 16 18 00 | 21 18 | | | E. N. E. | Moderate. | Cir. Cum. | 8 | N'd. & E'd. | 29.91 |
| " 13 | Midn't. | 15 36 20 | 22 2 | | | E. N. E. | Moderate. | Cirrus. | 2 | N'd. & E'd. | 29.90 |
| | 8 A. M. | 14 59 00 | 22 45 | S. 10° W. | 0.3 | E. N. E. | Moderate. | Clear. | 0 | | 29 90 |
| | Noon. | 14 57 30 | 23 15 30 | | | N. E. by E. | Moderate. | Cirrus. | 1 | | 29 90 |
| | | | " Standing in for | | Porto | Praya." | | | | | |
| Feb. 28 | Midn't. | At anchor Por | to Praya Bay. | | | | | | | | |
| | 8 A. M. | | | | | | | | | | |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 30 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 65. | 67. | | | | | | | tures as per column—At 8.30, a passing shower—at 9.30, sounded for temperatures as per column (too much sea—the *two* cylinders at 50 fathoms both failing to bring up water, so much drift). |
| 65. | 67.5 | | | | | | | WEDNESDAY, JANUARY 9th, 1850.—Throughout this day a heavy sea from N. & E. (too heavy to get correct deep sea temperatures)—At 1.20 p. m. sounded for temperatures as per column (cannot be depended upon as correct)—ends squally, with showers of rain and wind variable from N. E. to E. S. E. |
| 70. | 68.5 | 67.5 | 66. | 5, much rippled. | | | | THURSDAY, JANUARY 10th, 1850.—Commences with, and until 8 a. m., pleasant, with a heavy sea from N'd. & E'd—too much sea to sound for temperatures—From 8 a. m. to 4 p. m., pleasant—At 11, sounded for temperatures as per column—saw a shoal of porpoises—At meridian, commenced search for "*Maria Rock*"—At 4 p. m. sounded for temperatures as per column (cylinders at 50 fathoms came up empty, so much drift and heavy sea-way)—At 5.30 p. m. hove to for soundings—had observed some discoloration of the water, appearing of a greenish hue. From 6 to 8 employed sounding—Sounded with 500 fathoms, and no bottom—temperatures as per column—Cylinders at 50 fathoms came up empty—too much sea and drift to trust to any of these temperatures, surface water getting into the cylinders, coming up so much out of the perpendicular—Lying to for the night—Water observed to be unusually phosphorescent. |
| 70. | 68.5 | | | | 19°20'W | | | |
| 66. | 67.5 | | | | | | | |
| 64. | 67. | | | | | | | |
| 68. | 67.5 | 66.5 | 65. | 3, much rippled. | | | | |
| 68. | 67.5 | | 65. | 5, much rippled. | 16° W. | | | |
| 66. | 68. | | 100 fath's. 65.8° | | | | 500 | |
| | | | 500 fath's. 63.° | | | | | |
| 65. | 67.8 | | | | | | | |
| 65. | 67.5 | | 200 fath's. | | | Surface. | | FRIDAY, JANUARY 11th, 1850.—*In search of "Maria Rock."*—At daylight, made sail, and continued search for Maria Rock—Weather, until 8 a. m., pleasant, with a heavy sea from the N'd. & E'd—From 8 a. m. to 4 p. m. pleasant. At 10.30 got a cast of the lead with 300 fathoms line and no bottom—temperatures as per column—Water appearing somewhat discolored. ☞ We had been more leaky since leaving Teneriffe than usual, and during the watch from 8 a. m. to noon it was discovered that the leak had increased considerably, so much so as to require the schooner to be pumped out every watch—At noon, discovered the foremast was sprung at the partners, and on further examination, found it was badly sprung—At 12.45 p. m. bore up for Porto Praya—Ends pleasant, with heavy sea from Northward and Eastward. |
| | 69. | 68. | 63.° | | | 1028.5 | 300 | |
| | | | 300 fath's. 56.° | 8, rippled. | | 300 fath's | | |
| | | | | | | 1028.7 | | |
| 69. | 69. | | | | 16° W. | | | SATURDAY, JANUARY 12th, 1850.—During this day pleasant, with a heavy sea from N'd. & E'd—At noon, hauled up 1½ points, in order to cross assigned position of Bonetta Rock—From noon to 3 p. m. crossed over the assigned position of Bonetta Rock, without seeing any indication of a rock or shoal—The state of the foremast prevented any further investigations—At 3 p. m. bore away again for Porto Praya—Ends pleasant, water quite phosphorescent. |
| 65. | 68. | | | | | | | |
| 64. | 69. | | | | | | | SUNDAY, JANUARY 13th, 1850.—Commences pleasant, with heavy sea from N'd. & E'd.—At 9.10 a. m. discovered land on weather bow (bearing W. N. W. per compass)—Island of Mayo—At 11, discovered land ahead. Island St. Jago, bearing W. by N. per compass—From 1 p. m. to 2 p. m. standing along S. E. coast of St. Jago—At 2.30 p. m. came to in Porto Praya Bay—Found the U. S. Ships Portsmouth, John Adams, and Brig Bainbridge, under command of Commodore Gregory, and store ship Relief, at anchor in the port—Ends with moderate breeze from N'd. & E'd., and pleasant weather. |
| 72. | 70. | | | | | | | |
| 68.5 | 71. | | | | 16° W. | | | THURSDAY, FEBRUARY 28th, 1850.—Commences with, and until 4 a. m., calm and pleasant—From 4 to 8 a. m., moderate breezes from N. E., and pleasant—From 8 to noon, fresh breezes from the N. E., with hazy warm weather—At 8.30 a. m., got underway and stood out to sea under jib and mainsail—At 8.40, hove to for the Brig Porpoise—At 9.15, filled away and made sail—Porpoise in company—At 9.30, took our departure—The U. S. Flag Ship Portsmouth, at anchor near Quail Island, (a quarter of a mile East of S. E. end,) bore per compass N. 10° W., distant 6 miles—From meridian to 4 p. m., pleasant; passed through tide rips—From 4 to 8 p. m., pleasant weather, with heavy swell from N. E.—At 6, peak of Fojo bore per compass N. 26° W.—Ends pleasant. |
| 68.5 | 72. | | | | | | | |
| 73.7 | 2.5 | | | | | | | FRIDAY, MARCH 1st, 1850.—Throughout this day, pleasant weather, with a thick hazy atmosphere and heavy swell from N'd and W'd. |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| Feb. 28 | 4 P. M. | 14 41 | 23 53 | | | E. N. E. | Fresh. | Hazy. | 0 | | 29.90 |
| March 1 | Midn't. | 14 22 00 | 25 11 00 | | | N. N. E. | Moderate. | Cirro Stratus. | 4 | Stationary. | 29.93 |
| | 8 A. M. | 14 10 | 25 11 | S. 40° E. | 0.8 | N. N. E. | Moderate. | Cirro Stratus. | 6 | N'd & E'd. | 29.92 |
| | 4 P. M. | 14 19 | 26 14 40 | Westerly. | 0.4 | N. E. by N. | Moderate. | Cirrus & Hazy. | 5 | Stationary. | 29.90 |
| " 2 | Midn't. | 14 25 20 | 27 14 40 | | | N. E. by N. | Moderate. | Thick haze & Mist. | | | 29.92 |
| | 8 A. M. | 14 36 | 28 29 35 | S. 65° W. | 0.7 | N. N. E. | Moderate. | Hazy. | 0 | Stationary. | 29.95 |
| | 4 P. M. | 14 49 | 29 42 20 | Westerly. | 0.5 | N. E. | Fresh. | Cir. Stratus. | 8 | N'd & E'd. | 29.96 |
| " 3 | Midn't. | 15 4 20 | 30 52 35 | | | N. E. | Fresh. | Cum. Stratus. | 6 | N'd & E'd. | 29.98 |
| | 8 A. M. | 15 16 20 | 32 16 30 | S. 79° W. | 0.7 | N. E. by E. | Fresh. | Cir. Cum. & Strat. | 7 | N. E. | 29.98 |
| | 4 P. M. | 15 30 40 | 32 21 | | | E. N. E. | Moderate. | Cum. Stratus. | 8 | N. E. | 30.00 |
| " 4 | Midn't. | 15 41 | 34 22 | | | E. N. E. | Moderate. | Cir. Cum. & Strat. | 5 | Cirrus from the W'd Cum. from Northeast. | 30.03 |
| | 8 A. M. | 15 46 40 | 35 30 20 | S. 62° W. | 0.7 | East. | Moderate. | Cir. Cum. Strat. | 7 | N'd & E'd. | 30.01 |
| | 4 P. M. | 15 55 20 | 36 23 30 | Westerly. | 0.3 | E. N. E. | Moderate. | Cum. Strat. | 5 | E. N E. | 30.00 |
| " 5 | Midn't. | 16 4 20 | 37 17 | | | E. by N. | Moderate. | Cir. Cum. Strat. | 8 | E. N. E. | 30.00 |
| | 8 A. M. | 16 6 30 | 37 59 | South. | 0.2 | E. S. E. | Light breeze. | Cir.Cum.& Nimb. | 9 | N'd & E'd. | 29.99 |
| | 4 P. M. | 16 12 30 | 38 34 | | | S. S. W. | Light breeze. | Cir. Cum. & Strat. & Nimbus. | 8 | Irregular & variable. | 29.96 |
| " 6 | Midn't. | 16 19 | 39 8 40 | | | S. E. | Light breeze. | Cum. Strat. & Nimbus. | 8 | Irregular & variable. | 29.99 |
| | 8 A. M. | 16 26 | 39 42 40 | 00 | 0.0 | Variable from E. to S. S. W. | Light breeze. | Cum. Strat. | 9 | Variable & irregular. | 30.00 |
| | 4 P. M. | 16 35 20 | 40 21 | 00 | 0.0 | Variable from S.S.W. to S.E. | Light breeze. | Cir. Cum. Strat. | 5 | Southward. | 29.94 |
| " 7 | Midn't. | 16 42 30 | 40 55 | | | S. S. W. | Light breeze. | Cum. Stratus. | 3 | Southward. | 29.97 |
| | 8 A. M. | 16 56 30 | 41 37 | N. 51° W. | 0.4 | S. W. | Light breezes. | Cum. & Stratus. | 6 | Southward. | 29.98 |
| | 4 P. M. | 17 2 20 | 42 2 30 | | | W. S. W. | Very light breeze. | Cum. Stratus. | 2 | Stationary. | 29.97 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | 50 fath's | 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 82. | 74. | | | | | | | Saturday, March 2d, 1850.—During this day, pleasant weather, with a heavy N. E. swell—Noticed numerous flocks of flying-fish—Atmosphere remarkably hazy—Between noon and 4 p. m., passed directly over "*Dubreuil's Vigia*," as marked upon the last edition of Blunt's chart of the North Atlantic, without any indication whatever of the vicinity of a shoal or rock—This "vigia" is not noticed on Maury's chart of the North Atlantic. |
| 73. | 73. | | | | | | | |
| 71.5 | 73. | | | | 17° W. | | | |
| | | | | | | | | Sunday, March 3d, 1850.—During this day, pleasant, with a heavy N. E. swell. |
| 78. | 73.5 | | | | | | | Monday, March 4th, 1850.—During this day, pleasant, with a heavy swell from N. E.—Between 4 p. m. and midnight, passed through the centre of the "*Maelstrom of the Dutch*," as placed upon the charts of Maury and Blunt, without any indication whatever of a shoal, rock, or unusual currents—It will be noticed we sailed a long distance, upon its latitude. (The bottle thrown overboard this day, lat. 15° 51', long. 36° 9', was picked up August 23d, 1850, East Caicos, lat. 21° 39' N., long. 71° 26' W.—M.) |
| 74.5 | 74.5 | | | | | | | |
| 72. | 74.2 | | | | 16° W. | | | |
| 80. | 74. | | | | | | | Tuesday, March 5th, 1850.—During this day, weather unpleasant, with frequent showers of rain—Moderate swell from N'd and E'd—wind very variable throughout the day—*remarkable cessation of the trades*—Water at night very phosphorescent. |
| 73. | 73.5 | | | | | | | Wednesday, March 6th, 1850.—Commences with, and until 8 a. m., variable breezes and squally appearances—occasional light squalls with drizzling rain—From 8 a. m. to 4 p. m., light variable breezes, prevailing from the S'd. and W'd.—Many flocks of flying-fish seen, and some oceanic birds—Ends with breeze from S. S. W., but very unsteady—A long regular swell from N. E. throughout the day. |
| 71.5 | 73. | | | | 15° W. | | | |
| 84. | 73. | | | | | | | Thursday, March 7th, 1850.—Commences pleasant—At 4 a. m. a light shower of rain—During the day a long swell from N. E.—Saw a "stormy petrel"—From 8 to midnight, squally appearances—At 11 p. m. a *heavy rain squall*. |
| 73. | 73.5 | | | | | | | |
| | | | | | | | | Friday, March 8th.—Commences with, and until 2.30 a. m., constant rain—Swell from N. E.—From 4 a. m. to 5.30, rain, with squally appearances—During the day a heavy long N. E. swell—Ends with pleasant weather. |
| 72. | 73.8 | | | | 12° W. | | | |
| | | | | | | | | Saturday, March 9th.—During this day pleasant weather, with a long heavy N. E. swell. From meridian to 4 p. m., saw several bunches of sea-weed, (the first seen,) and throughout the day numerous flocks of flying-fish—At 5.30 p. m., the "Porpoise" being so far astern as to give us time to sound for temperatures, (in waiting for her to close for the night), hove to and sounded for temperatures, as per column; (the cylinder at 50 fathoms showed surface temperature; no doubt surface water had got into it in hauling up.)—From 6 to 8 p. m., saw many small bunches of sea-weed. |
| 80. | 74.3 | | | | | | | |
| 72. | 73.8 | | | | | | | |
| 72. | 74. | | | | 13° W. | | | Sunday, March 10th.—During this day pleasant weather, with a long N. N. E. swell—From 8 to meridian, saw some small bunches of sea-weed, and during the rest of the day numerous small bunches of sea-weed arranged in line, running east and west—At 5.30 p. m. ("Porpoise" being 4 or 5 miles astern,) hove to, and sounded for temperatures, as per column—During the day started up many flocks of flying-fish. |
| 80. | 74.8 | | | 9, rippled. | | 1027.8 | | |
| 72.5 | 74.5 | | | | | | | |
| | | | | | | | | Monday, March 11th.—During this day pleasant weather, with a long N. E. swell—At 6 a. m., a shower of rain—Observed numerous bunches of sea-weed arranged in lines, in the direction of the prevailing wind, and started up many large flocks of flying-fish—The sea-weed we examined at times, and found to be in a fresh state.—At 5.30 p. m., "Porpoise" being far astern, hove to, and sounded for temperatures, as per column. |
| 72.5 | 74.5 | | | | | 1027.8 | | |
| 80. | 75. | | | | | | | |
| | | | | | | | | Tuesday, March 12th.—During this day pleasant, with a long swell from E. N. E.—Passed large quantities of sea-weed, arranged as usual in the direction of the wind—Started up many flocks of flying-fish—Saw three oceanic birds (*boatswains*,) flying about us—At 5.30 hove to and sounded for temperatures, as per column. |
| 74. | 74.5 | | | | | | | |
| 73. | 74.5 | | | | 10° W. | 1027.8 | | |
| | | | | | | | | Wednesday, March 13th.—Commences with, and until 4 a. m., pleasant weather—At 2 a light shower of rain—From 4 a. m. to 8 a. m., |
| 81. | 75.5 | | | | | | | |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | Bar. |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| March 8 | Midn't. | 17 3 25 | 42 9 | | | Var. fm S.W. to N. E. and squally. | Very light airs. | Cum. Stra.&Nim. | 6 | Irregular. | 30.02 |
| | 8 A. M. | 17 1 45 | 42 41 | S. 78° W. | 1.0 | Varying from S. to S. E. | Light airs. | Cum. and Nimb. | 9 | N'd&S'd&W | 30.03 |
| | 4 P. M. | 17 6 45 | 43 39 | W. | 0.9 | N. by E. | Moderate. | Cir. Cum. & Strat. | 5 | N.N.E. Stra. statio'y. | 30.05 |
| " 9 | Midn't. | 17 12 20 | 44 21 20 | | | N. by E. | Moderate. | Cumulus. | 3 | N'd & E'd. | 30.09 |
| | 8 A. M. | 17 13 20 | 45 16 | N. 70° W. | 0.6 | N. by E. | Moderate. | Cum. & Strat. | 5 | Northward. | 30.07 |
| | 4 P. M. | 17 19 | 46 11 45 | Westerly. | 0.4 | N. by E. | Moderate. | Cir. Cumulus. | 7 | N. N. E. | 30.05 |
| " 10 | Midn't. | 17 22 | 46 51 30 | | | N. E. | Light breeze. | Cir. Cumulus. | 8 | N. E. | 30.09 |
| | 8 A. M. | 17 21 | 47 35 30 | Southerly. | 0.2 | N. E. by N. | Light breeze. | Cumulus. | 8 | N'd & E'd. | 30.06 |
| | 4 P. M. | 17 23 30 | 48 24 40 | Westerly. | 0.4 | N. E. by E. | Moderate. | Cir. Cum. | 7 | N. E. | 30.05 |
| " 11 | Midn't. | 17 24 30 | 49 17 | | | N. E. | Moderate. | Cir. Cum. | 7 | N. E. | 30.05 |
| | 8 A. M. | 17 16 30 | 50 18 | South. | 0.7 | N. E. | Moderate. | Cir. Cum. Stratus & Nimbus. | 6 | N. E. | 30.04 |
| | 4 P. M. | 17 15 40 | 51 22 40 | | | E. N. E. | Moderate. | Cir. Cum. | 7 | N'd & E'd. | 30.06 |
| " 12 | Midn't. | 17 19 30 | 52 17 | | | E. N. E. | Moderate. | Cumulus. | 3 | E. N. E. | 30.07 |
| | 8 A. M. | 17 18 15 | 53 24 | S. 61° W. | 0.5 | E. N. E. | Moderate. | Cumulus. | 4 | N. E. | 30.05 |
| | 4 P. M. | 17 18 45 | 54 12 45 | | | E. by N. | Moderate. | Cumulus. | 4 | E. N. E. | 30·08 |
| " 13 | Midn't. | 17 17 | 55 6 | | | East. | Moderate. | Cumulus. | 5 | E. N. E. | 30.03 |
| | 8 A. M. | 17 11 40 | 56 4 | S. 62° W. | 0.4 | Varying from E. N. E. to E. S. E. | Moderate, with squalls. | Cum. Stratus, & Nimbus. | 8 | E. N. E. | 30.08 |
| | 4 P. M. | 17 12 | 57 9 | | | E. N. E. | Moderate. | Cir. Cum. | 8 | E. N. E. | 30.05 |
| " 14 | Midn't. | 17 18 00 | 58 16 00 | | | N. E. | Fresh with squalls. | Cum. Stratus and Nimbus. | 9 | E. N. E. | 30.12 |
| | 8 A. M. | 17 13 20 | 59 26 20 | S. 57° W. | 0.3 | E. N. E. | Fresh. | Cir. Cum. | 6 | E. N. E. | 30.09 |
| | 4 P. M. | 16 53 40 | 60 27 20 | | | E. by N. | Moderate. | Cirro Cum. | 8 | Eastward. | 30.08 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 50 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 75. | 75.5 | | | 16, smooth. | | | | frequent squalls, accompanied by heavy rain—A long swell from the east—From 8 to meridian occasional rain squalls—From meridian to 6 p. m. pleasant weather, with a heavy sea from N. E.—At 5.30 p. m., hove to, and sounded for temperatures, as per column ("Porpoise" being well astern.)—The cylinder at fifty fathoms failed on account of too much sea on—From 8 p. m. to midnight, squally, with occasional rain—A heavy sea running from N. E.—Water very phosphorescent—Passed much sea-weed during the day, arranged as usual in long parallel lines in the direction of the wind. |
| 72. | 76. | | | | 9° W. | | | |
| | | | | | | 1027.8 | | |
| 74.5 | 75.5 | | | | | | | |
| 73. | 75. | | | | | | | THURSDAY, MARCH 14th, 1850.—Commences pleasant, with a long heavy swell from N. E.—From 4 a. m. to 8 a. m., squally, with occasional rain—Passed much sea-weed—From 8 a. m. to 4 p. m., pleasant weather—At 5.30, light shower of rain—Observed several detached bunches of sea-weed, and numerous flocks of flying-fish—From 4 p. m. to 8 p. m., pleasant weather—At 5.30, hove to, and sounded for temperatures as per column—(Porpoise being so far astern)—Saw much sea-weed—From 8 to midnight, squally—At 11, a shower of rain—Ends squally with rain. |
| 72. | 74.5 | | | | | Surface, | | |
| | | | | | | 1028. | | |
| | | | | | | 100 fath. | | |
| | | | | | | 1028.2 | | |
| 76. | 75. | | | | | | | FRIDAY, MARCH 15th, 1850.—Commences with unpleasant thick weather, squally and rain—From 4 a. m. to 8 a. m., pleasant weather—At daylight discovered the Island of Antigua, bearing N. W.—At 7, made the Island of Montserret—At 8, South point of Montserret bore S. 85° W.—From 8 to meridian, squally, with occasional light rain—a long heavy swell from N. E.—At meridian, South point Island Montserret, bore E. N. E. ½ E.—Saw much sea-weed arranged in long parallel lines, East and West—From meridian to 4 p. m., pleasant, with squally appearances—From 4 p. m. to midnight, thick weather, with frequent squalls, accompanied with rain. |
| 73. | 75.2 | | 65. | | 7° W. | Surface, | | |
| | | | | | | 1028. | | |
| 73. | 75.5 | | | | | 100 fath. | | |
| 77. | 75.8 | | | | | 1028.2 | | |
| | | 74. | 66. | | | | | |
| 74. | 75.2 | | | | | | | SATURDAY, MARCH 16th, 1850.—Midnight to 8 a. m., pleasant weather—At 6 a. m., made land—East end of St. Croix bearing W. ½ N.—From 8 to meridian, pleasant weather—made land on weather bow—Isle of St. John—At noon standing for the rock, Frenchman's cap, off harbor of St. Thomas—Meridian to 4 p. m., pleasant weather—Standing in for the harbor—At 1.15, hove to for the Porpoise to close—At 2 p. m., came to anchor in harbor of St. Thomas. |
| 74. | 75.8 | | | | 5° W. | Surface, | | |
| | | | | | | 1028. | | |
| 78. | 76. | | | | | 100 fath. | | |
| | | 75. | 66. | 10, rippled. | | 1028.2 | | |
| 73. | 76.5 | | | | | | | MONDAY, MAY 6th, 1850.—*Harbor of St. Thomas.*—From 8 a. m. to 4 p. m. moderate breezes from the N'd. & E'd., and pleasant—At 1 p. m. got underway, and stood out of the harbor—Sailing through Culebra or Virgin Passage—From 4 to 8 pleasant—At 4.10 p. m., took the departure from the following bearings—Sail Rock, S. 21° E.—West end of Savanna Island, S. 40° E.—North point of Tabaga Island, N. 82° E.—North point of Culebra Island, S. 63° W.—At 6.15, sounded for temperatures as per column—8 p. m. to midnight, cloudy, with a squall of wind and rain at 9.50. |
| 73. | 76. | | | | | | | |
| 78. | 76.5 | | 67. | 14, smooth. | 3° W. | | | TUESDAY, MAY 7th, 1850.—Commences with, and until 8 a. m., cloudy, unpleasant weather, with a heavy sea running from the N'd. & E'd.—Many "Mother Carey's Chickens" about us, and passed much sea-weed, ranged in parallel lines in the direction of the wind, N. E. & S. W.—From 8 a. m. to 4 p. m. clear pleasant weather—Passed over the assigned position of "*Clowe's Reef,*" without any indication whatever of the vicinity of a shoal or reef—kept a sharp look out for it from the mast-head—A heavy sea on, so that we could not get up the wire for sounding—At 9.50 sounded for temperatures as per column—there was too much drift, owing to the heavy sea, to get the temperatures at 100 fathoms, the cylinders working open and bringing up surface water, and the markers of the Syx's self-registering thermometer working down in consequence of the jarring in hauling up the line—Started up many flocks of flying-fish, and several stormy petrels following in our wake—Noticed occasional fragments of sea-weed—From 4 p. m. to midnight, pleasant weather—At 4.15 sounded for temperatures as per column—Much Gulf-weed seen ranged in parallel lines with wind, as usual. |
| 75. | 76. | 75.5 | | | | | | |
| 74. | 76. | | | | 2° W. | | | |
| 82. | 76.5 | | | | | | | |
| 75. | 76.5 | | 71. | | | | | |
| 74. | 77. | | | | | | | |
| 78. | 77.5 | | 69. | 10, rippled. | | | | WEDNESDAY, MAY 8th, 1850.—Midnight until 8 a. m. pleasant weather; At midnight sounded for temperatures as per column—8 a. m. to 4 p. m. pleasant—At 3.45, sounded for temperatures as per column—4 p. m. |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per. h. | Direction. | Force. | Winds. | Portion. | Motion from | Bar. |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| March 15 | Midn't. | 16 50 15 | 61 24 20 | | | E. by N. to N. E. | Mod. & squally. | Cum. & Nimbus. | 6 | Eastward. | 30.07 |
| | 8 A. M. | 16 47 00 | 61 54 30 | West. | 1.0 | E. by N. | Mod. with squalls | Cum. & Nimbus. | 8 | N'd & E'd. | 30.03 |
| | 4 P. M. | 16 52 30 | 63 0 00 | | | E. N. E. | Fresh with squalls | Cum. & Strat. | 9 | N. E. | 30.05 |
| " 16 | Midn't. | 17 27 00 | 63 52 00 | | | N. E. | Mod. with squalls. | Cum. & Nimbus. | 6 | N. E. | 30.06 |
| | 8 A. M. | 17 43 30 | 64 23 20 | | | E. N. E. | Moderate. | Cumulus. | 3 | N. E. | 30.07 |
| | | At 2 P. M. Anchored in the Harbor of St. Thomas. | | | | | | | | | |
| " 14 | 4 P. M. | | | | | | | | | | |
| May 6 | Midn't. | | | | | | | | | | |
| | 8 A. M. | | | | | | | | | | |
| | 4 P. M. | 18 23 | 65 9 | Point of departure. | | | | | | | |
| " 7 | Midn't. | 18 54 | 65 17 | | | N. E. by E. | Moderate, with a squall at 9.50 p. m. | Cum. Stra. & Nim. | 6 | N. E. | 30.02 |
| | 8 A. M. | 19 16 20 | 65 47 | N. 80° W. | 0.9 | N. E. | Light, with squalls | Cirro Cumulo, Stratus & Nimbus. | 7 | N. E. | 30.00 |
| | 4 P. M. | 19 56 | 66 18 20 | Westerly. | 0.4 | N. E. | Moderate. | Cirrus. | 2 | N'd. & E'd. | 29.99 |
| " 8 | Midn't. | 20 29 | 66 22 | | | N. E. | Light breeze. | Cir. Cum. Strat. | 3 | N'd. & E'd. | 30.02 |
| | 8 A. M. | 20 55 | 66 32 30 | N. 64° W. | 0.7 | E. N. E. | Light breeze. | Cumulus. | 2 | N'd. & E'd. | 30.00 |
| | 4 P. M. | 21 4 | 66 32 30 | Westerly. | 0.4 | E. N. E. | Very light airs. | Cum. & Stratus. | 4 | N'd. & E'd. | 30.01 |
| " 9 | Midn't. | 21 30 | 66 44 | | | N. E. by N. | Light breeze. | Cum. & Cumulo Stratus. | 2 | N'd. & E'd. | 29.99 |
| | 8 A. M. | 22 3 | 67 1 | N. 45° W. | 1.0 | N. E. by N. | Light breeze. | Cumulus. | 4 | N. E. | 30.00 |
| | 4 P. M. | 22 14 | 67 1 30 | Westerly. | 1.5 | N. E. by E. | Very light breeze. | Cum. Stra. & Cir. | 2 | Stationary. | 30.00 |
| " 10 | Midn't. | 22 32 | 66 54 | | | E. by S. | Very light breeze. | Cum. & Cumulo Stratus. | 3 | Cum. N. E. Stra. stat'y. | 30.01 |
| | 8 A. M. | 23 7 | 66 53 | N. 69° W. | 0.8 | E. by N. | Light breeze. | Cum. & Stratus. | 6 | N'd. & E'd. | 30.03 |
| | 4 P. M. | 23 44 | 66 16 | Easterly. | 0.5 | E. S. E. | Moderate. | Cum. & Cumulo Stratus. | 9 | N. E. | 30.02 |
| " 11 | Midn't. | 23 53 | 66 6 | | | S'd. & E'd. | Lt. variable airs. | Cir. Cum'o. Stra. & Nimbus. | 6 | N. E. | 30.05 |
| | 8 A. M. | 24 22 | 65 39 | N. 38° E. | 0.8 | E. S. E. | Light breeze. | Cirrus & Cumulus. | 3 | N'd. & E'd. | 30.06 |
| | 4 P. M. | 24 43 30 | 65 25 30 | Westerly. | 0.3 | E. S. E. | Light breeze. | Cumulus. | 3 | Eastward. | 30.07 |
| " 12 | Midn't. | 24 59 30 | 65 18 30 | | | East. | Light breeze. | Cumulus. | 2 | Eastward. | 30.07 |
| | 8 A. M. | 25 38 40 | 64 58 | N. 37° W. | 0.9 | E. S. E. | Moderate. | Cum. Stratus. | 2 | Eastward. | 30.05 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 50 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | | | | | | |
| 75. | 77.3 | | | | | | | to midnight, pleasant—Passed much sea-weed during the day—Dolphins playing about us, and many stormy petrels in our wake—Considerable swell from the N. E. |
| 74. | 77. | | | | | | | THURSDAY, MAY 9th, 1850.—Midnight to 8 a. m. pleasant—At 1 sounded for temperatures as per column—From 8 a. m. to 4 p. m. pleasant weather—Got up and shipped apparatus for sounding with the wire—At 11 hove to and furled all sail—At 11.50 commenced reeling off—At 1.20 stopped the reel very gradually, in order to reel up, there being 2,200 fathoms wire out, up and down, and no indication of having reached the bottom—but so soon as the motion of the reel was completely arrested, the wire parted about five fathoms under water, and we lost 2,195 fathoms of wire, with a 12 lb. lead and a Stellwagen cup attached to it.—This break was evidently caused wholly by the motion of the vessel—the lifting of the stern in pitching—though there was but little swell, and nearly calm.—This lifting of the stern, however slight, produces immense strain upon the wire—At 2 struck the reel below. |
| 80. | 77.5 | | | | | | | |
| 75. | 77. | | | | | | | |
| 75. | 77. | | | | | | | |
| | | | | | | | | From 4 p. m. to midnight pleasant weather—At 4.30 sounded for temperatures as per column—Saw an unusual quantity of sea-weed during the day—Many dolphins and stormy petrels—also a large quantity of *medusæ*. |
| 77.5 | 78. | 76.5 | 75. | | | | | FRIDAY, MAY 10th, 1850.—Midnight to 8 a. m. pleasant—At 4 sounded for temperatures as per column—At 7.30 passed large quantities of sea-weed—8 a. m. to 4 p. m. pleasant—At 11, sounded for temperatures as per column—4 p. m. to midnight pleasant—4.30 sounded for temperatures as per column—A long swell during the day from the N. E.—Passed much sea-weed and many stormy petrels in our wake. |
| 76. | 77. | 76. | 74.5 | 10, rippled. | 2° E. | | | |
| 82. | 78.5 | 77.5 | 75.5 | 10, rippled. | | | | SATURDAY, MAY 11th, 1850.—Midnight to 8 a. m. pleasant—A shower of rain during the first hour—Saw a water-spout astern, about 4 miles; a heavy swell from N. E.—8 a. m. to 4 p. m. pleasant—At 8.30 sounded for temperatures as per column—At 11.20 lowered a boat and tried the current—found a surface current of $\frac{1}{3}$ knot per hour, setting W. N. W.—At 3.30, lowered a boat again to try the currents; found a surface current of $\frac{1}{3}$ of a knot per hour, setting West, and a strong under current, at the depth of 126 *fathoms*, of 1 knot per hour, setting to W. S. W.; At 4 p. m. sounded for temperatures as per col.—The sea was covered during the day with a species of medusæ of a reddish-brown color, circular in shape and from $\frac{1}{8}$ to $\frac{3}{8}$ inch in diam: passed but little sea-weed. |
| 77. | 78. | 77. | 76. | | | | | |
| 76.5 | 77.5 | | | | 2° E. | | | |
| 80. | 79. | | 75. | 17, smooth. | | | | |
| 77.5 | 78.5 | 77.5 | 74. | | | | | |
| 76. | 78. | | | | 2° 30′ E. | | | SUNDAY, MAY 12th, 1850.—Midnight to 8 a. m. pleasant—At 3 sounded for temperatures as per column; a long swell from the East'd—8 a. m. to 4 p. m pleasant—At 9, sounded for temperature as per column—Passed much sea-weed arranged as usual in parallel lines in the direction of the wind—At 3.30 lowered a boat to try the currents—found a surface current setting N. N. E. $\frac{1}{3}$ knot per hour, and a very strong under current at the depth of 126 fathoms, of $1\frac{1}{4}$ knots per hour, setting to the S. E.—This was well ascertained by several trials.—At the same time sounded with 540 fathoms line—got 480 up and down, no bottom—temperature as per column—the Syx's thermometer at 500 *fathoms* failed—the markers had penetrated the mercury—A heavy easterly swell during the day—Ends pleasant. |
| 82. | 78.3 | 78.5 | 75. | 10, rippled. | | | 2200 | |
| 78. | 77.8 | | | | | | | |
| | | 77.5 | 75. | | | | | |
| 76. | 77. | | | | 1° 50′ E. | 1028.3 | | |
| | | 77.5 | 76. | | | | | |
| 81. | 77.8 | 78. | 77. | | | | | |
| 78. | 77. | | | | | | | MONDAY, MAY, 13th, 1850.—Midnight to 8 a. m. pleasant—Passed quantities of gulf-weed in a very decayed state—From 8 a. m. to 4 p. m., pleasant—At 3, sounded for temperatures as per column—From 4 p. m. to midnight, pleasant—At 3.30, got a cast of the lead, 500 fathoms up and down, and no bottom—temperatures as per column—While sounding, lowered a boat to try currents, found an under current (126 fathoms,) of $1\frac{1}{2}$ knots per hour, setting W. S. W., and a surface current of $\frac{1}{3}$ knot, setting E. by S.—Passed fresh looking sea-weed in patches—One self-registering thermometer came up from the 500 fathoms depth, the bulb broken, and the one at 200 fathoms, the markers had penetrated the mercury—A heavy swell during the day from the Eastward. |
| 75. | 77. | 76. | 70.5 | 15, smooth. | 2° 20′ E. | 1028.4 | | |
| 80. | 77.3 | 77.5 | 73.5 | 14, slightly rippled. | | | | |
| 77. | 77. | | | | | | | |
| 75. | 73.5 | | 69. | | | | | |
| | | | | | | Surface. | | |
| 76. | 75. | 72. | 68.5 | 12, slightly rippled. | | 1028.4 | | TUESDAY, MAY 14th, 1850.—Midnight to 8 a. m., pleasant—Made preparations for sounding with the wire, it being nearly calm and not much swell—Passed sea-weed in patches and detached bunches— |



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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| May 12 | 4 P. M. | 25 55 | 64 43 | Westerly. | 0.3 | S. E. by E. | Light breeze. | Cirrus & Stratus. | 5 | Eastward. | 30.06 |
| " 13 | Midn't. | 25 58 30 | 64 39 | | | | Light var. airs. | Stratus. | 1 | Stationary. | 30.05 |
| | 8 A. M. | 26 26 | 64 25 30 | N. 14° E. | 1.3 | S. E. | Light airs. | Cirro Cumulus & Stratus. | 3 | Eastward. | 30.01 |
| | 4 P. M. | 26 42 | 64 4 | Easterly. | 0.4 | S. S. E. | Light breezes. | Cumulus and Cumulo Stratus. | 6 | S'd & E'd. | 30.02 |
| " 14 | Midn't. | 26 47 | 63 57 | | | N. W. | Var. light winds. | Cum. & Stratus. | 5 | S.W.& N.W. | 30.03 |
| | 8 A. M. | 26 46 | 63 53 | | 0.0 | N. N. W. | Var. light winds. | Cumulus. | 2 | N'd & W'd. | 30.04 |
| | 4 P. M. | 26 46 | 63 49 | | | Northward. | Light airs. | Cirrus & Cumulus. & Cum. Stratus. | 8 | Northward. | 30.08 |
| " 15 | Midn't. | 27 15 30 | 63 54 | | | E. N. E. | Fresh with squ'ls. | Cum. & Nimbus. | 9 | Eastward. | 30.10 |
| | 8 A. M. | 27 57 | 64 7 | N. 39° W. | 0.7 | East. | Fresh breeze. | Cumulus. | 6 | Eastward. | 30.11 |
| | 4 P. M. | 28 18 | 63 57 | Westerly. | 0.4 | E. S. E. | Moderate. | Cirrus & Cumulus | 7 | Eastward. | 30.08 |
| " 16 | Midn't. | 28 31 | 64 33 | | | S. E. | Light breeze. | Cirro Cumulus. | 8 | N'd & W'd & S'd & E'd. | 30.07 |
| | 8 A. M. | 28 54 | 65 33 | N. 60° W. | 0.4 | S. by E. | Moderate. | Cirro Stratus. | 8 | Southwest. | 30.00 |
| | 4 P. M. | 29 15 30 | 66 33 | | | S. by W. | Moderate. | Cirrus & Stratus. | 6 | Southward. | 29.96 |
| " 17 | Midn't. | 29 36 30 | 67 31 | | | S. W. | Fresh breezes & Squalls. | Cumulo, Stratus & Nimbus. | 9 | S'd & W'd. | 29.90 |
| | 8 A. M. | 29 48 | 67 54 | East. | 0.1 | S. W. | Fresh. | Nimbus & Cum. | 10 | S'd & W'd. | 29.90 |
| | 4 P. M. | 30 8 | 67 58 | Easterly. | 0.4 | W. N. W. | Light breeze. | Cumulo Stratus. | 3 | Stationary. | 29.88 |
| " 18 | Midn't. | 30 12 | 67 56 | | | N. N. W. & Northward. | Light var. airs. & Calms. | Clear. | 0 | | 29.88 |
| | 8 A. M. | 30 6 | 67 56 | South. | 0.3 | | Calm. | Clear. | 0 | | 29.90 |
| | 4 P. M. | 30 7 | 68 11 | | 0.0 | S. W. by S. | Light breeze. | Clear. | 0 | | 29.90 |
| " 19 | Midn't | 30 13 | 68 44 | | | S. S. W. | Light breeze. | Cumulus. | 1 | Stationary. | 29.91 |
| | 8 A. M. | 30 21 30 | 69 17 | N. 60° W. | 0.4 | S. W. | Light breeze. | Cirrus & Stratus. | 2 | Stationary. | 29.92 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | Water. Surface. | 50 fath's | 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 80. | 75. | 76. | 69. | 10, slightly rippled. | | 480fath's | | From 8 a. m. to 4 p. m., pleasant—At 9, lowered a boat and tried currents—found a slight surface drift setting to the Westward, and a strong *under current* of 1¼ knots per hour setting N. by E.—At 9.30, got up and shipped the wire cylinder in its frame—furled all sails, and at 10.30, commenced reeling off—At 11.15, shipped the reel, having 1050 fathoms wire up and down, without striking bottom—(a considerable swell getting up, was afraid to trust more)—At 11.18, commenced reeling up—At 1.50, finished reeling up, having been 2h. 30m. in doing so; the wire was carefully dried and oiled in reeling up —The Syx's thermometer came up from the depth of 1000 fathoms, unbroken, and indicating 49° temperature as per column — At 4, heavy sea running from the N. E., and weather looking ugly—From 4 p. m. to midnight, unpleasant squally weather, with rain and very heavy sea. |
| 75. | 75.5 | | | | | 1028.4 | 480 | |
| 75. | 75. | | | | 1° 32′ E. | | | |
| 82. | 77.5 | 75. | 74. | 10 f., ripl'd. | | | | |
| | | | | | | | 500 | |
| | | 76.5 | 74.5 | | | | | |
| | | | 500 fath's. | | | | | |
| | | | 53° | 15, smooth. | | 1028.5 | | WEDNESDAY, MAY 15th, 1850.—Midnight to 8 a. m., pleasant weather, with a heavy head sea (from N. E.,)—8 a. m. to 4 p. m., heavy head sea—Passed much sea-weed ranged in parallel lines E. and W.—At 2.30, sounded with 540 fathoms line, no bottom—took temperatures as per column—too much sea for correct temperatures. (*Note.—In fact they can only be relied upon as quite correct in smooth times, when the vessel is steady.* The lifting and plunging in rough sea, opens the valves of the cylinders, so that they come up with surface water. The difficulty with the self-registering Syx's thermometer, is that the markers are jarred out of place, work downwards, and thus indicate falsely; the pointers or markers often come up entirely immersed in the Mercury. I am satisfied, that those supplied us are of inferior quality — Passed sea-weed ranged in parallel lines as usual, in a breeze, and of quite green and fresh appearance—4 p. m. to midnight, pleasant—a heavy sea running from N. E. |
| 77. | 76.5 | | | | | | | |
| 76. | 75.5 | | | | 0°40′ W. | | | |
| | | | 1000 fath's. | | | | 1050 | |
| 82. | 77. | | 49° | | | | | |
| 73. | 75.2 | | | | | | | |
| 72. | 74. | | | | | | | |
| 76. | 73. | 74. | 73. | | | 1028.7 | | THURSDAY, MAY 16th, 1850.—Midnight to 8 a. m., pleasant—At 5.20, sounded for temperatures as per column—Much sea-weed and a shoal of porpoises—8 a. m. to 4 p. m., pleasant—9.30, sounded for temperatures as per column—but little sea-weed—At 1.45, sounded for temperatures as per column—Many flying fish, and stormy petrels—Much sea-weed ranged in parallel lines with the wind—4 p. m. to midnight, unpleasant weather, with occasional rain—At 7, sounded for temperatures as per column—A heavy sea during the day from the S'd. and W'd. |
| | | | 500 fath's. | | | 500 fath's | | |
| | | | 62° | | | 1028.6 | | |
| 72. | 72.5 | | | | | | | |
| | 71. | 70.5 | 67. | | | | | |
| 71. | 71. | | | | 2° W. | | | |
| | 71. | 67.5 | 66.5 | | | 1028.5 | | |
| | 73. | 72. | 68. | | | | | |
| 76. | 72. | | | | | | | |
| | 74. | 74 | 67. | | | | | FRIDAY, MAY 17th, 1850.—Midnight to 8 a. m., squally, with heavy rain, and a heavy irregular sea—8 a. m. to 4 p. m., pleasant, with an irregular heavy swell—At 11, sounded for temperatures as per column —Much sea-weed, stormy petrels, many *Portuguese men-of-war*, and a small *land bird* flew on board of us—4 p. m. to midnight, pleasant weather, with a heavy irregular swell—6.50, sounded for temperatures as per column. |
| 75. | 74. | | | | | | | |
| 71. | 69.5 | | | | 1° 7′ W. | | | |
| | 70. | 69.3 | 65. | | | | | SATURDAY, MAY 18th, 1850.—Midnight to 8 a. m., clear pleasant weather, with a heavy swell—8 a. m. to 4 p. m., pleasant—At 9, lowered a boat to try the currents, found a surface current of ⅓ knot per hour, setting N. W. by W., and a slight under current setting N. E.—At 9.30, sounded for temperatures as per column—But very little sea-weed seen—At 1, the swell having moderated, commenced preparations for sounding with the wire—At 2.55, commenced reeling off—At 3.55, had got down 2050 fathoms wire, without any evidence of reaching bottom, and on then stopping the reel for the purpose of reeling up (fearing to trust more to the swell, although it was but slight,) the wire parted at one of the joints near to the surface of the water—Lost 2050 fathoms of wire, a self-registering thermometer, a 12 lb. lead and Stellwagen cup—This break was caused as before, by the lifting of the stern in the slight swell of the sea—4 p. m. to midnight, pleasant weather—11.50 sounded for temperatures as per column. |
| 78. | 71. | | | | | 1028.4 | | |
| | | 68. | 64.5 | | | | | |
| 72. | 69.5 | | | | | | | |
| 68. | 69. | | | | | | | |
| | 70. | 69.5 | 65. | 15, slightly rippled. | | | | |
| | | | | | | 1028.3 | | |
| 74. | 70.5 | | | | 0° 8′ W. | | 3050 | |
| 72. | 71. | 67.5 | 65. | | | | | |
| | | | | | | 1028.2 | | SUNDAY, MAY 19th, 1850.—Midnight to 8 a. m., pleasant—Quantities of gulf-weed in lines parallel with the wind, as usual—A swell setting from the S. W.—8 a. m. to 4 p. m., pleasant—11, sounded for temperatures as per column—4 p. m. to midnight, pleasant—Observed |
| 71. | 70.5 | | | | | 100fath's | | |
| | 71. | 69. | 64.5 | 12, rippled. | | | | |
| | | | | | | 1028.1 | | |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h'r. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| May 19 | 4 P. M. | 30 29 | 69 32 | | 0.0 | W. S. W. | V. Light wind. | Cirrus, Cumulo & Status. | 5 | S. W. | 29.91 |
| " 20 | Midn't. | 30 34 | 70 3 | | | S. W. by S. var. & squally | Moderate. | Cum. & Nimbus. | 4 | N'd & W'd. | 29.92 |
| | 8 A. M. | 30 35 30 | 70 2 30 | N. 39° W. | 0.5 | | Calm. | Cum. & Nimbus. | 8 | S'd. & W'd. & irregular. | 29.95 |
| | 4 P. M. | 30 40 | 70 42 | Westerly. | 0.7 | N. N. E. | Light breezes. | Cir. Cum. Stratus. | 7 | S'd & W'd. & N. & E. | 29.99 |
| " 21 | Midn't. | 30 47 | 71 24 | | | N. N. E. | Moderate. | Cumulus. | 4 | N. E. & S'd & E'd. | 30.00 |
| | 8 A. M. | 30 46 | 72 6 | South. | 0.5 | E. by N. | Moderate. | Cumulus. | 6 | Eastward. | 30.04 |
| | 4 P. M. | 30 54 | 72 46 | Easterly. | 0.4 | East. | Moderate. | Cirro Cumulus. | 7 | Eastward. | 30.08 |
| " 22 | Midn't. | 31 25 | 72 50 | | | E. by N. | Light breeze. | Cirro Cum. Strat. | 6 | Cir. Cum from N. E. & Cum Strat. stationary. | 30.11 |
| | 8 A. M. | 31 53 | 73 3 | S. 79° W. | 0.5 | E. N. E. | Light breeze. | Cum & Cum Stra. | 5 | N'd & E'd. | 30.09 |
| | 4 P. M. | 32 6 | 73 19 | Westerly. | 0.8 | N. E. | Light breeze. | Cir. Cum Stratus. | 7 | N'd & E'd. | 30.17 |
| " 23 | Midn't. | 32 35 | 73 24 30 | | | N. E. by E. | Light breeze. | Cum. Stratus. | 1 | Stationary. | 30.16 |
| | 8 A. M. | 32 58 | 73 36 | N. 48° W. | 0.9 | N. E. by E. | Light breeze. | Cum. Stratus. | 2 | N'd & E'd. | 30.12 |
| | 3 P. M. | | | | | | | | | | |
| | 4 P. M. | 33 3 | 73 52 | Westerly. | 1.5 | Calm. | Calm. | Cumulus. | 3 | N'd & E'd. | 30.13 |
| | 8 P. M. | | | | | | | | | | |
| " 24 | Midn't. | 33 23 | 73 28 | | | N. W. | Light breeze. | Cirrus & Cumulus | 4 | N. W. | 30.10 |
| | 4 A. M. | | | | | | | | | | |
| | 8 A. M. | 33 36 | 73 2 | N. 37° E. | 0.4 | N. N. E. | Moderate with fresh squalls. | Cum & Nimbus. | 9 | Northward. | 30.07 |
| | 12 Noon. | 33 32 30 | 72 52 | | | | | | | | |
| | 4 P. M. | 33 27 | 72 45 | | | N. N. E. | Moderate with fresh squalls. | Cum & Nimbus. | 10 | N'd & E'd | 30.06 |
| | 6 P M. | | | | | | | | | | |
| | 7 P. M. | | | | | | | | | | |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface. | THERMOMETER. Water. 50 fath's. | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| o | o | o | o | | | | | |
| 75. | 71.5 | | | | | | | lightning to the N'd. and W'd—At 8, sounded for temperatures as |
| | 71.5 | 71. | 66. | | | | | per column—Ends with squally appearances. |
| | | | | | | | | MONDAY, MAY 20th, 1850.—Commences with, and until 4 a. m., squally |
| 73. | 71.4 | | | | | | | appearances—Lightning in all quarters of the horizon, with thunder |
| | | | | | | | | —A heavy thunder and lightning storm with very heavy rain from 3 |
| | | | | | | | | to 4—Wind veering all around the compass—From 4 to 8 a. m. |
| 71. | 70. | | | | 2° 40' E. | | | calm with heavy irregular swell—Much sea-weed about the schooner |
| 75. | 71. | 69. | 67. | 8, smooth. | | | | —From 8 a. m. to 4 p. m. pleasant weather—At 10.40 lowered a boat |
| | | | | | | | | to try surface and under currents; found a surface current of ¾ knot |
| 78. | 71. | | | | | | | per hour setting W. by N. and an under current, at 126 fathoms, of |
| 73. | 71.5 | 71. | 65. | | | 1028.4 | | 1 knot per hour setting to the eastward—Sounded for temperature as |
| | | | | | | 100fath's | | per column—Passed quantities of sea-weed—From 4 p. m. to mid- |
| | | | | | | 1028.3 | | night pleasant—Saw some gulls and stormy petrels—At 7 sounded for |
| 73. | 71.5 | | | | | | | temperatures as per column—Ends with lightning and squally appear- |
| 72. | 72. | 70.5 | 69. | 8, rippled. | | | | ances to the southward and westward. |
| | | | | | | | | TUESDAY, MAY 21st, 1850.—Midnight to 4 a. m. pleasant weather with |
| 70. | 72. | | | | | | | squally appearances and a heavy swell—At 6 sounded for tempera- |
| 74. | 73.5 | 71.5 | 68. | | | 1028.2 | | tures as per column—Syx's thermometer came up with the markers im- |
| | | | | | | 100fath's | | mersed in the mercury—8 a. m. to 4 p. m. pleasant—At 1.40 sounded |
| 75. | 73.2 | | | | | | | for temperatures as per column; the minimum marker of the Syx's |
| 72. | 74. | 69. | 68.5 | | | 1028.3 | | thermometer was found to have penetrated the mercury—Saw but |
| | | | | | | | | little sea-weed—4 p. m. to midnight pleasant—At 8 sounded for tem- |
| 72. | 73. | | | | | | | peratures as per column—Saw a flock of oceanic birds. |
| | | | | | | | | WEDNESDAY, MAY 22d, 1850.—Commences and until 4 a. m. pleasant; |
| | | | | | | | | lightning to the northward and westward—4 a. m. to 8 a. m. pleasant |
| | | | | | | | | —At 5 sounded for temperatures as per column—Swell setting from |
| 69. | 71.5 | 70.5 | 66.5 | 10, rippled. | 0° 5' E. | 1028.4 | | northward and eastward—Saw stormy petrels and other oceanic birds; |
| | | | | | | 100fath's | | very little gulf-weed—From 8 a. m. to 4 p. m. clear pleasant weather |
| | | | | | | 1028.4 | | with a smooth sea—At 9 lowered a boat to try currents, found a sur- |
| 69. | 71. | | | | | | | face current of ¼ knot setting to the southward and an under current |
| | | | 500 fath's. | | | 500fath's | | (at 126 fathoms) of ½ knot setting to E. by N.—Sounded with 500 |
| 75. | 72. | | | | | | | fathoms line; no bottom; temperature as per column—At 1 p. m. got |
| | | | 57° | 10, rippled. | | 1028.3 | | up the wire reel and made preparations for sounding—the sea being |
| | | | | | | | | remarkably smooth and every appearance of a continuance of fine |
| 76. | 72. | | | | | | 500 | weather—At 2 commenced reeling off—At 3.45 having put down 1900 |
| | | | | | | | | fathoms without reaching bottom, the wire parted at the reel owing |
| 71. | 71.5 | 71.5 | 67. | | | | 1900 | to one of the links of the wire catching upon another on the reel, it |
| | | | | | | | | broke at the short nip of the link, this was the largest sized wire— |
| 69. | 73. | | | | 1° E. | 1028.3 | | Lost 1900 fathoms wire, one 8 lbs. lead and one Syx's self-register- |
| | | | | | | | | ing thermometer—At the time the wire parted we were reeling off |
| 76. | 75. | 73.5 | 70. | | | 100fath's | | very slowly and carefully, and used likewise the precaution of a stop- |
| | | | | | | | | per at the fair leader over the stern; but the wire worked through |
| 77. | 79. | | | | | 1028.3 | | the stopper—From 4 p. m. to midnight pleasant weather—Saw oceanic |
| | | | | | | | | birds and a hump-back whale, and a shoal of black-fish. ☞ *Note*, |
| 77. | 76. | | | | | | | This leaves but 800 fathoms wire on the reel, and the Syx's self-regis- |
| 72. | 76.5 | | | | | | | tering thermometer lost, was the only one left worth anything—I in- |
| | | | | | | | | tended to trust to the depth of 1500 fathoms, as I had succeeded with |
| | | | | | | | | it to the depth of 1000 fathoms on a prior occasion. |
| 73. | 76. | 73. | 72. | | | | | THURSDAY, MAY 23d, 1850.—Midnight to 4 a. m. pleasant—At mid- |
| 70. | 76. | | | | | | | night sounded for temperature as per column—A long regular swell |
| | | | | | | | | from N. E.—8 a. m. to 4 p. m. pleasant—At 9 lowered a boat to try |
| 71. | 77. | | | | | | 200 | current, and sounded for temperature, as per column—found a surface |
| | | | | | | | | current of 1 knot setting to W. N. W., and an under current (at 126 |
| 72. | 76.5 | | | | | | | fathoms) of 1 knot setting to eastward—Saw two fin back whales, |
| | | | | | | | | and many stormy petrels in our wake, as usual—Passed large quan- |
| 73. | 76.7 | | | | | | | tities of whale-feed—4 p. m. to midnight, pleasant—11.40 sounded |
| | | | | | | | | for temperature, as per column—Passed large quantities of "Brit." |
| 70.5 | 75.5 | | | | | | | ☞ *Note.* An extraordinary rise in the temperature of the surface |
| | | | | | | | | water appearing during this day—from 71° to 79°, as per column— |
| 69. | 72. | | | | | | | must likely be an off-shot from the gulf stream. |
| | | | | | | | | FRIDAY, MAY 24th, 1850.—Midnight to 8 a. m. unpleasant, squally |
| | | | | | | | | weather, with occasional rain and a long heavy swell from the N'd |
| | | | | | | | | and W'd—8 a. m. to 4 p. m. unpleasant, thick squally weather with a |
| | | | | | | | | heavy head sea and occasional rain—At meridian commenced the |
| | | | | | | | | search for *Ashton Rock*—4 p. m. to midnight thick squally weather |



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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | Bar. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h'r. | Direction. | Force. | Kinds. | Portion. | Motion from | |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| May 24 | 8 P. M. | | | | | | | | | | |
| | 10 P. M. | 33 24 30 | 72 41 | | | | | | | | |
| | 11 P. M. | | | | | | | | | | |
| " 25 | Midn't. | 33 28 30 | 72 41 | | | E. by N. | Moderate with fresh squalls. | Cumulus. | 9 | N'd & E'd & irregular. | 30.06 |
| | 8 A. M. | 34 1 | 72 35 | | | E. by S. | Fresh with squalls. | Cirro Cumulus & Nimbus. | 9 | Eastward. | 30.03 |
| | 11 A. M. | | | | | | | | | | |
| | 12 Noon. | 34 14 | 72 29 | | | | | | | | |
| | 1 P. M. | | | | | | | | | | |
| | 4 P. M. | 34 2 | 72 25 | Easterly. | 0.7 | S. E. | Fresh with squalls. | Cum. & Nimbus. | 10 | Eastward. | 30.01 |
| | 6 P. M. | | | | | | | | | | |
| " 26 | Midn't. | 33 46 | 72 27 | Southerly. | 0.8 | E. S. E. | Moderate. | Cum. & Nimbus. | 10 | S'd & E'd. | 30.02 |
| | 2 A. M. | | | | | | | | | | |
| | 6 A. M. | | | | | | | | | | |
| | 7 A. M. | | | | | | | | | | |
| | 8 A. M. | 34 46 | 72 11 45 | S. 50° E. | 0.6 | S. E. | Fresh. | Cirro Cumulus. | 7 | S'd & E'd. | 30.00 |
| | 9 A. M. | | | | | | | | | | |
| | 10 A. M. | | | | | | | | | | |
| | Noon. | 33 46 30 | 72 6 30 | | | | | | | | |
| | 4 P. M. | 33 53 | 71 49 | Easterly. | 0.2 | S. E. | Fresh. | Cir. Cum. & Nim. | 10 | S'd & E'd. | 29.96 |
| " 27 | Midn't. | 33 58 | 71 38 | | | S. E. | Fresh, with sq'lls. | Cum. & Nim. | 10 | S'd & E'd. | 29.96 |
| | 8 A. M. | 34 4 | 71 26 | | | S'd & var. | Mod. with squalls. | Cum. & Nim. | 9 | S'd & E'd. | 29.90 |
| | 9 A. M. | | | | | | | | | | |
| | Noon. | 34 3 | 71 12 | | | | | | | | |
| | 3 P. M. | 33 49 | 71 11 | | | | | | | | |
| | 4 P. M. | 33 49 | 71 17 | | | N. by E. | Moderate. | Cir. Cum. & Stra. | 3 | N. & E. & stationary. | 29.88 |
| | 8 P. M. | 33 46 | 71 42 | | | | | | | | |
| " 28 | Midn't. | 33 44 | 71 47 | | | N. W. | Moderate. | Cum. & Strat. | 2 | N'd & W'd & stationary. | 29.89 |
| | 2 A. M. | 33 40 | 71 56 | | | | | | | | |
| | 4 A. M. | 33 44 | 71 51 | | | | | | | | |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. Air. | THERMOMETER. Water. Surface | THERMOMETER. Water. 50 fath's | THERMOMETER. Water. 100 fathoms. | Transparency in fathoms. | Variation observed. | Specific gravity of sea water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | | | | | |
| 68. | 75. | | | | | | | with a very heavy head sea—At 8 sounded with 200 fathoms line; no bottom; too much sea for taking temperature at depths. ☞ *Note*—The sudden fall of 3½ degrees (75.5° to 72°) in the surface temperature from 6 to 7 p. m. was not, by some oversight, reported to me till 8 p. m.—We had then got into 75°, as per column—I wore ship and stood back to find and sound in this place of remarkable temperature—on going back, the temperature was tried every 10 minutes, and it was found to lower very gradually, and by 10 p. m. it had fallen to 72°; the same as passed over at 7—Here we hove to and sounded with 300 fathoms line and found no bottom—Before filling away the temperature was again tried and found to remain at 72°—Standing on a course N. by E. from this, it was found to increase gradually, and at midnight it again stood at 74°—There was too much sea for getting the temperature at depths—the cylinder came up empty or with surface water—that noted in the column for 100 fathoms cannot be depended upon, as most likely surface water was mixed with it. |
| 69. | 72. | | | | | | | |
| 69. | 72. | | 70. | | | | 300 | |
| 69. | 74. | | | | | | | |
| 69. | 76.5 | | | | | | | |
| 69. | 75. | | | | | | | |
| 69.5 | 73.5 | | | | | | | |
| 68. | 76.5 | | | | | | | |
| 70. | 76.5 | | | | | | | |
| 71. | 76. | 73.5 | 70.5 | 5, much rippled. | | | 300 | SATURDAY, MAY 25th, 1850.—"*In search of Ashton Rock.*"—Midnight to 4 a. m. unpleasant, squally weather with rain—8 a. m to 4 p. m. unpleasant weather with heavy rain—At 11.30 a very heavy squall of wind and rain—The head-rails were washed away by the heavy seas—4 to midnight, moderating and sea going down—At 6 got a cast of the lead with 300 fathoms line; no bottom; temperature as per column—From 6 to midnight, passing showers and squally appearances—Saw a water-spout to the N'd and W'd—While sounding at 6 p. m. noticed indications of a strong current setting to windward (S. E.)—for though, hove to under double reefed mainsail and jib with the bonnet off, and drifting bodily to leeward, the schooner kept to windward of the line—the line tending off to leeward, during the whole time at an angle of 45°. |
| 71. | 76. | | | | | | | |
| 71. | 76. | 73.5 | 70.5 | | | | 200 | |
| | 76. | | | | | | | |
| | 75. | | | | | | | |
| 71. | 71. | 70.5 | 69° | 10, rippled. | | 1028.3 | 500 | |
| | | | 400 fath's. | | | 500 fath's | | |
| | 71. | | 65° | | | 1028.3 | | |
| | 71. | | 500 fath's. | | | | | |
| | | | 61.5° | | | | | |
| 78. | 71.5 | | | | | | | SUNDAY, MAY 26th, 1850.—*In search of "Ashton Rock."*—Commences unpleasant with squally appearances—At 2 a. m. sounded with 200 fathoms line; no bottom; temperature as per column—from 4 a. m. to 8 a. m. pleasant—8 a. m. to meridian pleasant—sounded at 8 (*a sudden great fall in surface temperature*) with 500 fathoms line up and down, and no bottom—this was in latitude 33° 46′, longitude 72° 11′ 45″, by good observations—From meridian to 4 p. m. squally with rain—At 4 p.m. being in the assigned position of Ashton Rock, hove to and sounded with 500 *fathoms line*, and no bottom; temperature as per column—From 6 p. m. to midnight, thick unpleasant weather with squalls and frequent heavy showers of rain—At 11.30 sounded with 100 fathoms; temperature as per column—Saw no indications whatever of a rock or shoal. |
| 72. | 71. | 69.5 | 68. | | | | | |
| | | | 500 fath's. | | | | 500 | |
| | | | 64° | | | | | |
| 71. | 70.5 | 70. | 67. | | | | | MONDAY, MAY 27th, 1850.—*In search of Ashton Rock.*—Commencing with, and until 4 a. m., cloudy, rainy, and squally weather—Schooner hove to under foresail—a heavy sea—At day-light made sail—4 a. m. to 8 a. m. unpleasant—8 a. m. to 4 p. m., pleasant weather—A swell setting from the southward and eastward—Saw a few patches of sea-weed, Mother Carey's chickens, and other oceanic birds—4 p. m. to midnight pleasant, with heavy head sea—At 8 sounded with 500 fathoms line—No bottom—Temperature as per column—Saw no indications of a shoal or rock during the day. |
| 68. | 70. | | | | | | | |
| 68. | 68. | | | | | | | |
| | | | | | | | | TUESDAY, MAY 28th, 1850—*In search of Ashton Rock.*—Midnight to 8 a. m., pleasant—Passed sea-weed ranged in parallel lines in the direction of the wind—8 a. m. to 4 p. m., pleasant—At 9 sounded with 500 fathoms line—no bottom—temperatures as per column—Too much sea and drift to get correct temperatures—Lowered a boat to try currents—found a surface current of ¼ knot per hour, setting to the S. E., and an under current of ½ knot setting to N. E—At 11.45 filled away—4 p. m. to midnight, pleasant—At 7 sounded for temperatures, as per column—Ends calm—no indication of a shoal or rock this day—(*Note.*—The great and sudden rise in the temperature of the water, as observed this day, from 9 a. m. to 7 p. m., indicates having touched upon an offset from the Gulf Stream. |
| 69. | 69. | | | | | | | |
| 69. | 68.5 | 67.5 | 65.5 | | | | | |
| | | | 500 fath's | | | | 500 | |
| 69. | 68. | | 63° | | | | | |
| | | | | | | | | WEDNESDAY, MAY 29th, 1850.—*In search of Ashton Rock.*—Midnight until 8 a m., pleasant—Passed large quantities of fresh-looking sea-weed, |

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*Abstract Log—U. S. Schooner Taney,*

| DATE. | | Latitude. | Longitude. | CURRENT. | | WIND. | | CLOUDS. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Month & Day. | Hour. | N. | W. | Set. | Velocity in knots per h'r. | Direction. | Force. | Kinds. | Portion. | Motion from. | Bar. |
| | | ° ′ ″ | ° ′ ″ | | | | | | | | |
| May 28 | 8 A. M. | 33 36 | 72 5 | South. | 0.4 | N. W. | Moderate. | Cumulus. | 4 | N'd & W'd. | 29.85 |
| | 9 A. M. | | | | | | | | | | |
| | Noon. | 33 30 | 72 14 | | | | | | | | |
| | 4 P. M. | 33 38 30 | 72 3 | Easterly. | 0.3 | N. W. by N. | Moderate. | Cum. & Strat. | 2 | Stationary. | 29.87 |
| | 6 P. M. | | | | | | | | | | |
| | 7 P. M. | | | | | | | | | | |
| " 29 | Midn't. | 33 47 | 71 52 | | | N. N. W. | Light airs, & calm. | Clear. | | | 29.86 |
| | 8 A. M. | 33 53 | 71 58 | S. 6° W. | 1.4 | S. E. | Light airs. | Cum. & Strat. | 2 | Stationary. | 29.86 |
| | Noon. | 34 0 | 72 00 30 | | | | | | | | |
| | 4 P. M. | 34 12 | 72 0 | Easterly. | 0.5 | S. S. E. | Light breezes. | Cir. Cum. N Stra. | 5 | Southward. | 29.87 |
| " 30 | Midn't. | 34 51 | 72 9 30 | | | S. E. | Light breeze. | Cumulus. | 4 | S'd & W'd. | 29.81 |
| | 8 A. M. | 35 28 | 72 34 | S. 81° W. | 0.8 | S. by E. | Mod. with squalls. | Cum. & Nimb. | 9 | S'd & E'd | 29.72 |
| | 9 A. M. | 35 33 | 72 36 | | | | | | | | |
| | 10 A. M. | | | | | | | | | | |
| | Noon. | 35 51 30 | 72 45 | | | | | | | | |
| | 4 P. M. | 36 12 | 72 23 30 | Easterly. | 1.3 | W. N. W. | Fresh. | Cir Cum. & Nim. | 8 | N. W. | 29.69 |
| " 31 | Midn't. | 36 16 | 72 42 | | | N. W. | Light breeze. | Cir. Cum. | 9 | Westward. | 29.78 |
| | 4 A. M. | | | | | | | | | | |
| | 8 A. M. | 36 47 | 72 14 | N. 77° E. | 2.5 | N. N. E. | Light breeze. | Cir Cum. Strat. | 7 | W'd & N. E. | 29.81 |
| | Noon. | 37 4 | 72 26 | | | | | | | | |
| | 4 P. M. | 37 27 (no obs. | 72 37 cloudy.) | | | E. N. E. | Fresh. | Cir. Cum. Strat. | 8 | Eastward. | 29.82 |
| June 1 | Midn't. | 38 18 | 73 2 | | | E. by N. | Fresh. | Cum. & Nimb. | 10 | Eastward. | 29.82 |
| | 8 A. M. | 39 3 (no obs. | 73 20 cloudy.) | | | N. E. by E. | Fresh. | Cum. & Nimb. | 10 | Eastward. | 29.84 |
| | Noon. | 39 25 (by sight and sou | 74 3 ing land, nding.) | S. 65° W. | 0.7 | | | | | | |
| | 4 P. M. | 39 22 | 75 53 | | | N. E. | Fresh. | Cum. & Nimb. | 10 | N. E. | 29.83 |
| " 2 | Midn't. | 39 14 | 73 42 | | | N. E. | Fresh. | Cir. Cum. & Stra. | 8 | N. E. | 29.84 |
| | 8 A. M. | 39 11 30 | 73 25 30 | S. 25° E. | 0.4 | N. N. W. | Moderate. | Cum. Strat. & Cir. | 3 | N. | 29.88 |
| | 4 P. M. | 39 15 | 73 27 30 | | | N. W. | Light breeze. | Clear. | | | 29.93 |
| " 3 | Midn't. | 39 38 | 73 54 | | | W. by S. | Moderate. | Clear. | | | 29.93 |

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*Lieut. Joseph C. Walsh, Commander.*

| THERMOMETER. | | | | Transparency in fathoms. | Variation observed. | Specific gravity of sea-water corrected to 60° temperature. | Deep sea soundings, in fathoms. | REMARKS. |
|---|---|---|---|---|---|---|---|---|
| Air. | Water. | | | | | | | |
| | Surface. | 50 fath's | 100 fathoms. | | | | | |
| o | o | o | o | | | | | |
| 69. | 69.5 | | | | | | | covered with shells, and ranged in parallel lines with the wind—Passed a strong tide rip in direction N. and S.—8 a. m. to 4 p. m., pleasant—At 10.40 lowered a boat to try currents—found a surface-current of $\frac{1}{3}$ knot setting to the S. E., and an under current at 126 fathoms of 1 knot, setting to W. N. W.—Sounded for temperatures as per column—4 p. m. to midnight, pleasant—Saw several shoals of porpoises—At 7.30 sounded for temperatures, as per column—Ends with lightning to the S. and W.—Saw no indications of a shoal or rock during this day. |
| 74. | 76. | 76. | 500 fath's. | 8, rippled. | | 1028.3 | 500 | |
| | | | 68. | | | | | |
| 79. | 77. | | | | | | | |
| | 76. | | | | | | | |
| | 70. | 70.5 | 65. | | | | | THURSDAY, MAY 30th, 1850.—Midnight to 8 a. m., rainy, squally, unpleasant weather, with frequent thunder and lightning—at 6 sounded for temperatures, as per column—8 a. m. to meridian, damp, unpleasant weather, with rain—Passed but little sea-weed, many stormy petrels, boatswains, &c.—Meridian to 4 p. m. pleasant—At 1.15 sounded for temperatures as per column—Saw a shoal of porpoises, black fish, and large flocks of sea-birds—4 p. m. to midnight, pleasant—at 6.30 sounded for temperatures as per column—Ends cloudy, with a short, irregular sea. (*Note.*—The rise in temperature of the water at 9, a. m. indicated being on the edge of the Gulf Stream in lat. 35° 33′ N., long. 72° 36′ W. The highest temperature of the Gulf Stream during the day was 79°. |
| 74. | 70.5 | | | | | | | |
| 70. | 70.5 | | | | | | | |
| 80. | 71. | 70.5 | 67. | | | 1028.3 | | |
| | | | | | | 100fath's | | |
| 78. | 71. | 70.5 | 67. | | 2° 40′ W. | 1028.3 | | |
| 72. | 71.5 | | | | | | | FRIDAY, MAY 31st, 1850.—Midnight to 8 a. m., pleasant—At 4.15 sounded for temperatures as per column—Passed much sea-weed, and some pieces of rush—water appearing slightly discolored—8 a. m. to 4 p. m., pleasant—at 9 sounded for temperatures as per column—At 1 p. m. sounded for temperatures, as per column—4 p. m. to midnight, cloudy, unpleasant, with rain, and very cool—At 5.40 sounded for temperatures as per column—Saw a shoal of black fish—Ends fresh, with heavy sea from N. E.—(*Note*—At 4 a. m. temperature of surface water having fallen during the hour from 78° to 74°, indicated being upon the inner edge of Gulf Stream—it continued to fall steadily, as per column. |
| 70. | 71.8 | 70.5 | 67. | | | | | |
| | 73. | | | | | | | |
| | 77. | | | | | | | |
| 76. | 78.5 | 77.5 | 72.5 | 8, rippled. | | 1028.1 | | |
| 77. | 78.5 | | | | | | | SATURDAY, June 1st, 1850.—Midnight to 8 a. m. cold, unpleasant weather, with rain—At midnight sounded for temperatures as per column—At 6 a. m. sounded and struck bottom at 30 fathoms—Sand with yellow specks and broken shells—8 a. m. to 4 p. m., cold, unpleasant, and damp weather—At 10 sounded in 19 fathoms—gray sand, with black and yellow specks, and shells—At 10.30 and 11 sounded in 24 fathoms—gray sand, with black and yellow specks and shells—At 12 sounded in 17 fathoms—At 0.10 p. m. made land on lee bow—At 1 p. m. wore ship to the east'd.—A very heavy sea running from the N. E.—4 p. m. to midnight, cold, unpleasant weather, with heavy sea. (*Note.*—The temperature of the water at 5 and 6 a. m. was as low as 51°, a difference of 28° from that of the Gulf Stream.) |
| 72. | 79. | 77. | 74. | | | | | |
| 71. | 79. | | | | | | | |
| 66. | 74. | 70. | 64. | 5, much rippled. | | | | |
| 66. | 70.5 | 68.5 | 56.5 | 6, rippled. | | 1028.3 | | |
| 65. | 64. | 58.5 | 58. | | | 100 | | |
| 66. | 63.5 | | | | | 1028.2 | | SUNDAY, JUNE 2d, 1850.—Midnight to 8 a. m., pleasant weather, with heavy sea from the eastward—At 2.30 sounded in 22 fathoms—bottom, sand, with black and red specks—At 4 sounded in 26 fathoms—sand, with black specks and broken shells—At 8 sounded in 36 fathoms—sand, black specks and white shells—8 a. m. to 4 p. m., pleasant—4 p. m. to midnight, pleasant—At 8.10 p. m. received on board a New York pilot—At 11.40 p. m. made the light of Navesink. |
| 59. | 61. | 60.5 | 54. | | | | | |
| 56. | 55. | 54. | 50.5 | | | | | |
| 52. | 54. | | | | | | | |
| 52. | 53. | | | | | | | MONDAY, JUNE 3d, 1850.—Midnight to 8 a. m., pleasant—At 1, made Sandy Hook Light, bearing N. W. by N. $\frac{1}{2}$ N.—At 8 a. m. Sandy Hook Lighthouse bore N. 54° W., distant 2 miles—8 a. m. to 4 p. m., light variable airs—at 9.30 a. m., falling calm, anchored in $4\frac{1}{2}$ fathoms abreast of Sandy Hook—At 12.40 hove up, and stood in the bay—At 3.40 visited by health officer, and received pratique—At 5 p. m. came to off Castle Garden, in 5 fathoms water. |
| 51.5 | 53. | | | | | | | |
| 52. | 51.5 | | | | | | | |
| 60. | 55. | | | | 4° W. | | | |
| 58. | 53. | | | | | | | |

*Note.*—During the cruise from St. Thomas to New York, a bottle tightly sealed was thrown overboard every day, containing a paper showing our latitude and longitude, name and date, and request to the finder to forward the paper to Lieut. Maury, Superintendent of the National Observatory, noticing upon it carefully the date and locality in which picked up.

*Note.*—The "*variations observed*" were generally the mean of sets of azimuths and amplitudes. J. C. WALSH, *Lieut. Commanding.*



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# D.

*Directions for taking Deep Sea Soundings, prepared by the Bureau of Ordnance and Hydrography, under authority from the Secretary of the Navy, dated May 31st, 1850, and issued to the American Navy.*

Provide hanks, balls or skeins of wrapping twine. Let some contain 5,000 and some 10,000 fathoms each. This twine should be strong enough to bear a weight of 20 or 30 pounds. It should be as small as consistent with this degree of strength. It should be smooth, having nearly the specific gravity of salt water, so that in sounding at great depths it will not be likely to buoy up the shot or to part with the weight, or from its own friction through the water.

In order to prevent friction, the twine should be waxed or oiled. If oiled, the oil should be put on not more than three days before the twine is to be used.

It should be marked at every 100 fathoms, not by a knot, but by a silk thread tied tightly around.

Let the first 1,000 fathoms on each parcel be marked with a green silk thread wrapped twice about the twine and tied; then the 100 fathoms (from 100 to 900 inclusive) marks may be designated by a silk thread drawn between the strands of the twine as many times as there are hundreds to be marked.

In like manner mark 2,000 fathoms and its intermediate hundreds with a white silk thread. The 3,000 and intermediates with a blue. The 4,000, &c. with red. The 5,000, &c. with a black. The 6,000, &c. with yellow, and so on up to the 10,000 fathoms with other colors, or with striped threads.

The object is to attach these threads to the twine in such a manner as not to make knots, or rough, or uneven places by which the sounding line may catch.

Provide several large and light spools or reels on which the twine is to be reeled before proceeding to sound. These spools should be large enough and light enough to give line to the shot, as fast as the shot will take it, without danger of breaking.

Sling the shot to serve as the sounding weight by passing two straps of canvass, ½ inch broad, about it in such a manner as to hold, and as to have the straps to lay smooth and without knots or wrinkles about the shot. Let the sailmaker with his needle secure the sounding line to these straps, or leave a loop of strong twine to them to which the line may be tied.

Use one or more 32 lb. shot at a time according to the depth of the sounding, and the suggestion of experience. Sound at least once a day and give the latitude and longitude of the sounding with as much accuracy as possible, together with the depth, stating the allowance that is to be made for slack or stray line.

When the shot touches bottom, as will be known by the turning of the reel, break the twine and enter on the log—state the length of the part lost; this length should be determined accurately by measuring from the broken end to the next 100 fathom mark.

Unless at very great depths the most convenient sounding line will be a strong fishing line, say three of 5,000 fathoms each, marked at every 50 fathoms, wound on reels by which they may be reeled up rapidly.

The line should be smooth, with strength enough to bear a weight of 50 or 60 pounds; attach a bit of

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cork (the stopper of a champagne bottle will be large enough) to the lower end; toggle or tie the line on to the shot by a thread that will part on attempting to pull the shot up. When the shot touches bottom, haul on the line, detach it from the shot and the cork will bring the end to the top, and thus make the reeling up more easy.

With this line should be used a sounding nipper, which gives the exact depth up and down.

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## E.

*Captain Platt to Commodore Warrington.*

U. S. SLOOP OF WAR ALBANY, Harbor of St. Thomas, Island of St. Thomas,

*December 18th*, 1850.

COMMODORE LEWIS WARRINGTON,

*Chief of Bureau of Ordnance and Hydrography*,

SIR:—In conformity with your instructions, I have the honor to report the results of our attempts at deep sea soundings.

Our *first* sounding, made with the line provided by the Department for that purpose and a thirty-two pound shot attached, was attempted on the 6th of December, in lat. 38° 38′ North, and long. 66° 31′ West, both by dead reckoning. At this time, bottom was found with 1,625 fathoms of line which ran out in 27 minutes.

On the 7th and 8th of December, the weather was too rough to admit of sounding.

On the 9th of December, being by dead reckoning in lat. 33° 34′ North, and long. 61° 38′ West, we found bottom with 1,950 fathoms of line, running out in one hour and three minutes, with a drift of one mile. On this day, six shots were lost in unsuccessful efforts, the line parting with the heaving of the ship. A bar of iron, weighing 12 pounds, was also tried without success. The result was at last obtained by means of a bar of lead, weighing 13 pounds.

On the 10th of December, no sounding was attempted in consequence of the rough weather.

On the 11th of December, our *third* and *fourth* soundings were effected. The *former* was taken in latitude, by observation, 30° 05′ North, and longitude, by chronometer, 58° 12′ West, with 1,000 fathoms of line, running out in eleven minutes. The *latter* sounding was made in observed latitude 29° 58′ North, and longitude 58° 48′ West, with 1,500 fathoms of line running out in twenty-eight minutes. The former sounding was effected under a light breeze, and the latter in a dead calm, during which the ship had no perceptible drift. Eleven shots were expended before the soundings of this day were secured.

On the 12th of December, after lying to for two hours, nothing was accomplished. Five experiments were made with an oiled line, running out respectively 600, 20, 300, 550, and 200 fathoms. Two experiments were also made dispensing with the oil, the sixth shot for the day being lost at a depth of 200 fathoms. The seventh and last sounding for the day was made with three bars of iron lashed together, and having an aggregate weight of twelve pounds. The line parted near the reel, after 1,000 fathoms had been run out.

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Our time until the 16th was spent in waxing the twine, preparatory to other experiments. On this day, in observed latitude 21° 34′ North, and longitude, by chronometer, 63° 23′ West, the line ran out in 28 minutes, and parted at 1,600 fathoms.

This is the extent of our experiments, and the best results we have been able to attain. I am convinced, from the frequent parting of our line under such various circumstances, with reduced tension, at such different lengths, with equal strain, and with repeated marks of fracture in the strands, that the twine furnished was not suitable for our use. If the knots had been well fastened, and the strength of the line equal in all its parts, results more satisfactory to ourselves and more valuable to others might have been obtained.

I have reason to commend the perseverance and scientific skill with which these experiments have been prosecuted by Lieut. Taylor. I am confident that every effort within our power was made by him to render these soundings as complete and accurate as the materials furnished us would warrant.

Since discovering the defectiveness of the line, and observing its liability to fracture, especially at great lengths, I have been suspicious that in no case we had reached the bottom, although the cessation of the strain upon the line had been regarded as indicating a legitimate sounding.

About 14,000 fathoms of the sounding line supplied us yet remain, with which I shall continue experiments at the first opportunity.

I have the honor to be, respectfully
Your obedient servant,
CHARLES S. PLATT,
*Commanding the Albany.*

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## F.

*Extract from a letter to the Prussian Minister, Baron Von Gerolt, dated, National Observatory, June* 20, 1850.

"Speaking in advance somewhat of my publication, but leaning, nevertheless, upon the indications already given by the investigations which are in progress at this office with regard to the winds and currents of the sea, and the phenomena connected therewith, I may remark that certain conclusions have been forced upon me, with such veri-similitude, that it only remains for Professor Ehrenburg, with his microscope, to write the final Q. E. D. to them.

For instance, my investigations of the winds at sea, so far as they bear upon the subject, seem to indicate that the rivers and fresh water of the Northern temperate and frigid zones, are, for the most part, evaporated from the south torrid; or, more properly speaking, that they are taken up from the sea by the S. E. trade winds. Such at least is the indication; and certain facts so tend in their bearings, as to convert this indication into a conclusion that does not appear altogether forced.

As a general rule, most of the land is in the Northern, and most of the water in the Southern hemisphere. But notwithstanding the absence of evaporating surface in the Northern hemisphere, most of the precipitation

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takes place there, if we regard the waters that are discharged into the ocean by the rivers as an expression of the excess of the precipitation over the evaporation that takes place in the basins drained by these rivers. The basin of the Amazon is in both hemispheres; it is, therefore, common, and should not be counted as peculiar to either. The Rio de la Plata is the only great river then in the Southern hemisphere; whereas, in the Northern, are all the rivers, great and small, which give drainage to Europe, Asia, and America.

The question then comes up: Does the Atlantic afford evaporating surface sufficient to supply all the rivers of Europe and America with rain water? and, if so, by what winds do the vapors, that make these rains, travel both east and west from the same place?

Very little of America and no part of Europe is within the region of the N. E. trade winds; and the trades, because they come from a colder and go to a warmer climate, are eminently evaporating winds. But how is it to the North of the N. E. trade winds, where, on the surface of the earth, the S. W. are the prevailing winds? Here, as a general remark, the winds are going from a warmer to a colder climate, and therefore ought, it would seem, to precipitate more than they evaporate. Thus, take the isotherm of 60° Fahr. in the Atlantic, as an example: the mean dew point, we will suppose along this line, is between 50° and 60°, or at any other degree below 60°—suppose 55°—that we may choose for the illustration.

Now let us proceed still further North in this ocean until we reach the isotherm of 30°: on this line the mean dew point must be below 30°, how much we cannot say, nor is it material for the illustration that we should say. It is certainly below the mean dew point of 60°. Now what becomes of the vapor that has caused the mean dew point on the isotherm of 60° to change to that which belongs to the isotherm of 30°? It has been precipitated, and the capacity of the air to retain moisture has been lessened proportionably. In thus viewing the case, the question arises: Whence are the vapors taken which supply with rain, the sources of the rivers of the North temperate and frigid zones?

You will understand me as speaking in general terms, without regard to any of the exceptions caused by anomalies, such as the Gulf Stream and the like.

Where the N. E. and S. E. trade winds meet, they produce what is known as the belt of equatorial calms. This is one of the valves in the great atmospherical machine, through which the air that is brought from the North and the South by these trade winds, rises and escapes into the upper regions of the atmosphere, and thence returns to supply the sources of the trades with fresh air to make more winds of.

Now the question is: Does the air which is brought to this valve by the S. E. trades continue on towards the North in the upper regions of the atmosphere, while that which comes down as the N. E. trades continues on towards the South in like manner? or, does the air which the S. E. trades bring to this calm place, rise up and return to the South? or, does the air of the two trades intermingle here, and go, a part of it indiscriminately, either to the North or to the South as chance may determine?

I am inclined to favor an affirmative reply to the first of these interrogatories; and for these reasons, in addition to those already alluded to:

1st. Winter, late fall, and early spring, are the seasons of our greatest precipitation; and this is the



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time when the sun is pumping up the vapor with the greatest energy from the Southern, and with the least from the Northern oceans—and so too when the sun is pumping up vapor from the Northern hemisphere with all his energies, precipitation is most active in the Southern.

2d. The belt or band over which the S. E. trades prevail is much broader than that over which the N. E. trades prevail; consequently, supposing the velocity of each trade-wind to be the same, or nearly the same, the S. E. trade takes up more moisture because it sweeps over a broader belt of ocean; and, sweeping over a broader belt, it remains longer in contact with the evaporating surface; and consequently it may be supposed, it brings more moisture to the belt of equatorial calms whence the ascent takes place.

A large portion of this moisture is deposited in the equatorial calms, which we know is a region of constant precipitation. But where is the rest precipitated—in the Northern or Southern hemisphere? In the former, I suppose; because the rivers and the rain gauge, as far as it has been observed, tell us that the total amount of precipitation in the Northern, is greater than that in the Southern hemisphere; indeed, it is not necessary to consult the rain-gauge to learn this; the rivers themselves are sufficient rain-gauges for this purpose; for we have only to consider the volume of water annually discharged into the ocean by northern rivers, to see in it an expression for an amount by which the total precipitation is in excess of the total evaporation which takes place in the whole extent of valleys drained by such rivers. Search the Southern hemisphere for a like quantity, and the search will be in vain.

Seeing, moreover, that the Southern hemisphere has more water and less land than the Northern; that it has less rain and fewer rivers, it seems as though, in likening the atmosphere to an immense machine, we might call the Southern seas the boiler, and the Northern continent, the condenser for the mighty engine.

There is, perhaps, another point upon which an argument, not altogether without plausibility, may be turned in favor of this hypothesis.

The grounds for this argument are drawn from probability, and the argument itself rests on the degree of belief and faith we have in the perfection of terrestrial adaptations.

To state the argument in this point of view, we must consider the atmosphere, not only as a great condensing machine, but as an immense sewer, in which vast quantities of corrupt animal and vegetable matter are continually being cast for re-elaboration, purification, re-arrangement, and re-adaptation to the purposes of the animal and vegetable kingdoms.

Notwithstanding the quantity of matter that the plants and animals of the earth are continually taking from the atmosphere on the one hand, and are as continually casting into it on the other, so admirably arranged is it, and so perfect its system of circulation, now across the seas, now through forests, and again over deserts, burning sands, and frozen heights, that its proportions are never destroyed.

In this system of purification and preservation, we know that vegetation in active growth has much to do.

Now, then, if we consider that the N. E. trade winds, when they arrive at the equator, ascend, return to the North in the upper regions until they reach the parallel of 30° or 40° North, where they descend to the surface, and are known as what the Germans style the S. W. passage winds; if, I say, this be the course of

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atmospherical circulation, we shall see that the air in our winter time, when vegetation is asleep with us, would probably not be exposed to the processes necessary for its purification; and finally, if such were the system of circulation, the atmosphere of the Northern hemisphere would, in process of ages, probably become different from that of the Southern hemisphere.*

We have no reason to believe in the existence of any such change in the components of the atmosphere; and I had almost said, *therefore*, in any such partial system of circulation.

On the other hand: if we maintain that the S. E. trade winds blow North after ascending into the upper regions of the atmosphere through the equatorial calms, and that it is those winds, and not the N. E. trades that in their circuit blow our S. W. passage winds; if, I say, we maintain this, we shall see the beautiful adaptation for exposing them to the proper and wholesome vegetable agencies; our winter is the Southern summer; then the S. E. trades blow through the Southern forests which are then in their stage of activity.

Arrived at the equator—properly prepared for the use of the inhabitants of the North temperate and frigid zones—they ascend into the clouds; and, after reaching the parallel of 30° N., they descend, and are then felt as the vigorous, wholesome, and healthful S. W. passage winds of the Northern winter; continuing on towards the North frigid zone, they perform their office for the inhabitants of those inhospitable climates, and approaching the polar regions in spirals, they whirl continually around or about the pole in a direction contrary to that of the hands of the watch.

Returning thence in the upper regions towards the South, as unfit for further use, they are ~~not~~ next felt on the

* The extra-tropical regions of the North have much more land, and therefore it may be supposed many more organs than the South to breathe, consume, and vitiate the atmosphere; consequently in any given time, as in a Northern winter, the demands upon the atmosphere are very unequal on opposite sides of the equator. On one side, the animal kingdom is exacting from it in excess—on the other—the Southern summer—the vegetable.

Speaking in general terms, it may be said that man with his retinue of domestic animals, counts in the South but as one in a thousand at the North. These myriads of warm-blooded animals in excess, with the fires kindled by man in his Northern winter, leave us to infer that more air is required for animal consumption and combustion on one side of the equator than on the other, especially in our winter.

The air thus used, loses the proportions of gaseous combination required to make it wholesome; whence, therefore, is it purified? Not by the vegetation of the extra-tropical North, certainly, for its vegetation is then asleep.

But if we make this air return to the South by the route suggested, it will pass through the N. E. trade-wind region, and be partly replenished by the perpetually active vegetation there. Then rising in the equatorial calms, and overleaping, in the upper regions, the S. E. trades, it descends to the surface in the extra-tropical South, where it is summer, and where the forces of vegetation are in their most active operation.

Returning in the upper regions towards the North, from this part of its circuit, it first strikes the surface again as the S. E. trades, where vegetation is again perpetually active. Being now completely purified, it rises up again in the equatorial calms, overleaps in the upper regions the N. E. trades, and descends in the extra-tropical North, fresh with supplies in wholesome proportions for breathing lungs and winter fires.

And thus, though we cannot tell the reason why this earth was provided with zones of perpetual summer, alternate winter and opposite seasons, we may nevertheless see through the atmosphere one of the purposes for which this arrangement of seasons, combination of climates, and proportion of vegetable surface was intended to subserve.

In this view we see room for the harmony of nature. We have not a single physical fact going to prove that such is *not* the course of the circulation of the atmosphere about the surface of the earth; but we have many facts and circumstances which, though they do not prove, yet they suggest, that such is the course.

Thus, using a figure of speech, we may liken these evergreen places through which the winds go and return, to the lungs of the earth, with their three lobes: one in each of the two trade-wind regions, and one now at the North, now at the South, changing from one side to the other, as the summer comes and goes.—M. F. M.

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surface within or near the tropics, where vegetation is again in activity, to fit them for the inhabitants of that region; reaching the equatorial calms, they ascend, and are next felt on the surface in the South temperate zone as the N. W. passage winds.

Continuing on towards the South pole, and approaching it in spirals, they whirl about, but in a direction with the hands of a watch, and opposite to that which they took about the North pole.

Ascending into the upper regions of the atmosphere, they are next felt on the surface as S. E. trade winds; reaching the equator, ascending, and coming over into the Northern hemisphere, they are again felt to the North of the N. E. trades as the S. W. passage winds.

Let us suppose that this part of the circuit from the Antarctic regions be made in our summer, and of course in the Southern winter, when the vegetation here is not so active in its demands upon this atmosphere in motion, as it was in the other part of the supposed circuit.

But there this same atmosphere that has been but partially purified for Northern use in the Southern forests and fields, reaches us in our summer, when vegetation is in full activity, and when, therefore, all disproportions are properly compensated.

I have faith in the "great first thought." I believe that the animal and the vegetable kingdoms are in exact counterpoise; that through the dominions of nature all things are in exact and rigid proportions; that there is not a green leaf too much on one side, or an insect too many on the other. And because of this belief, I find plausibility and satisfaction in supposing that the general system of atmospheric circulation is as I have been endeavoring to represent it.

In this belief I am strengthened by my reading of a text of Scripture, (and the Bible no more than Nature can be wrong, for the Author of both is One,) which seems to apply to such a system of circulation:

"The wind goeth toward the South, it turneth about unto the North, it whirleth about continually; and the wind returneth again according to his circuits."

Compare this with what I have already said, and which my investigations taught me was the probable course of atmospherical circulation before I remembered me of what Solomon had said, and I think you will find with me, not proof, but grounds to suppose that such may be the system of circulation.

Cannot Professor Ehrenberg afford us the proof? Has he not discovered in the rain drops, or the snow-flakes, or the hail-stones of the northern temperate, or frigid zone, infusoria, or microscopic organisms of the Southern hemisphere? He has.

I have requested my friend Lieut. de Haven, who has sailed in command of the American expedition in search of Sir John Franklin, to collect for me specimens of colored snow, rain, and hail. I made this request with the hope that a microscopic examination would lead to the discovery of some animalculæ or other foreign matter in them, which would serve as a clue to guide me to the place whence the water that is precipitated there was probably evaporated.

Would the Professor, think you, be willing to undertake the examination of such specimens, provided they be obtained?

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I find since writing the above, by looking over his work which you are so kind as to lend me, and which I received the moment before commencing to thank you for it, that in his microscopic examination of sea-dust and bloody rain, he has already thrown much light upon this very question; his researches bear directly upon my investigations here touching the winds and currents of the sea.

In Lyons and Genoa both he has found microscopic organisms to fall from the air, and the "father-land" of some of these creatures he traces to South America. What a beautiful link, bright and strong, is not this in the chain of evidence circumstantial and direct, tending to prove that the general circulation of the atmosphere is such as our investigations indicate it to be.

According to this—according to the indications of the wind and current charts, and the unpublished results derived from the investigations carried on at this office, if "trade-wind dust" or "blood-rain" could be found in Oregon and the regions thereabout, I should expect, were specimens sent to Professor Ehrenberg, that he would discover in them organisms whose *habitat* is Polynesia.

I shall make inquiries for drops of blood-rain, colored snow, hail-stones, and specimens of showers of dust from that quarter. * * * * * * * * * * *

Respectfully, &c.,

M. F. MAURY.

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## G.

EXTRACTS FROM EHRENBERG'S WORK ON "*The Dust of the Trade Winds and Blood Rain, a great Organic invisible working and Life in the Atmosphere.* Berlin. 1849."

Translated by Prof. Hubbard, U. S. N.

[ p. 1. ] I.

"*About a Dust-Rain which filled for a long time the whole air in the North Atlantic, in* 17° 43′ *N. lat., and* 26° *W. long., and its commingling with numerous Flint-Shell Animalcules.*

[Communicated to the Berlin Academy May 23, 1844.]

"Mr. Darwin, the well-known and meritorious English traveler and writer upon coral reefs, narrates, in the history of his travels, that at the Cape Verd Islands, and on the high seas of that region, during his presence there, a fine dust constantly fell from the atmosphere; and that ships which were 380 nautical miles from land were, according to his written communications, surprised by it. The wind blew at that time from the African coast. Of this dust which fell upon the high seas at so great a distance from land, Mr. Darwin has sent a specimen for my microscopic investigation. Hitherto this dust, so frequent there, has been, on account of its yellowish red color, taken for volcanic ashes. Microscopic analysis has clearly shown that a considerable part, perhaps one-sixth of the whole, consists of flint-shelled polygastrica, and parts of well known flint earth terrestrial plants, as follows:

A. Flint-shelled polygastrica.

&c. (pp. 1, 2.) &c.



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[p. 2.] The best known European forms contained in this catalogue prove:

1. That each meteoric dust-rain was of terrestrial origin;

2. That the same was no rain of volcanic ashes;

3. That it was necessarily a dust raised up to a great height by a strong current of air or whirlwind from a dried-up swamp region;*

4. That the dust came not necessarily nor in accordance with demonstration from Africa, although the wind blew from thence as the nearest land, when the dust fell, because there are in it no forms whatever exclusively native to Africa;

5. That, since the *Himantidium Papilio*, a very peculiar form, has been hitherto detected only in Cayenne, (see the "Microscopic Life in South and North America," 1842, Plate II., Fig. 4,) and the *Surirella* is perhaps an American form, only two conclusions are before us: either the dust was raised to the upper strata of the atmosphere in South America, and by changed currents carried in various directions, or [3] the *Himantidium Papilio* and the *Surirella* are to be discovered elsewhere, that is, in Africa.

Consequently, since in some cases the organic or terrestrial origin of the meteoric dust-rains, or supposed ashes-rains, within 300 miles from land, has been put beyond doubt, it becomes us now to examine all similar phenomena with reference to the same question; and the direction of the wind at the time they occur will not indicate with certainty the source from whence they came."

## II.

### "*Farther Investigations of the Atmospheric Dust from the Atlantic Ocean and the Cape Verd Islands.*

[Communicated to the Academy Feb. 27, 1845.]

"Mr. Charles Darwin has sent five new specimens of similar dust for comparison. They were all collected in the years 1834 and 1838, in 15°, 17°, 19°, and 21° North latitude, on ships partly in St. Jago itself, partly on the high seas, many hundred miles from land.

This dust, formerly supposed by observers to be volcanic emissions, or African desert-dust, was, according to the previous specimens, distinguished as being filled with thirty-seven kinds of flint-shelled infusoria and phytolitharia, and therefore excluded from cosmical or volcanic relations; and it was also remarked that there were therein scarcely any of the already well-known forms peculiar to Western Africa; that on the other hand, there were two forms, *Himantidium Papilio* and *Surirella Peruviana*, peculiar to South America, below the equator.

The present more recent materials and investigations have shown us, in addition to the thirty-seven already found, yet thirty other small bodies, so that now from the atmosphere over that part of the ocean there are sixty-seven known organic forms, viz: 32 flint-shelled infusoria.

34 flint-earth phytolitharia.

1 polythalamium, with chalk shell.

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* Probably from the plains of the Oronoco, which are flooded for one part of the year, and parched up for the other. According to the general system of atmospherical circulation which the "Wind and Current Charts" have developed, the atmosphere which passes over those plains should, after ascending, flow in the direction in which this dust was gathered.—M.

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[4] Hitherto, only fresh-water forms had been observed, which could only come from the interior of continents, but now we can also perceive some true marine forms, which compel the opinion that the dust came from a coast region.

*Textilaria globulosa?* *Grammatophora oceanica.*

Among all the thirty additional forms, there is only one of a new kind, *Eunotia longicornis*, and this has already appeared in a very similar form in a Hungarian fossil stratum.

There is, moreover, among these thirty forms, not one peculiar to Western Africa; generally speaking, none peculiar to the African continent: but there is there the *Lithostylidium Rajula*, a flint-shelled animalcule like the egg of the ray-fish, which was previously known to the author as belonging to the Isle of France. On the other hand, the South American forms have been increased by four: *Eunotia quarternaria*, *Pileus*, *tridentula*, *Amphidiscus obtusus*; the three *Eunotia*, however, have hitherto been known only as from Senegambia and Guiana.

To all the six specimens of the Atlantic atmospheric dust, four organisms are common; many more, that is thirty-seven, occur similarly in several specimens. I now consider myself justified in the conclusion that all the Atlantic dust may come only from one and the same source, notwithstanding its extent and annual amount, which appear so great.

The constant yellow and reddish color of the dust, produced by ferruginous matter, its falling with the trade winds and not with the harmattan, according to the express account of an experienced sailor, (Sabine,) increase the interest of the phenomena.

The *Eunotia triodon*, a northern form, is very unexpected in three of the specimens.

Forms which fell living from the atmosphere have not yet been observed.

*Meyen* had in 1836, in his voyage round the world in a Prussian merchant ship, observed near the Cape Verd Islands, the sails of the vessel reddened to windward, and remarked that it was caused by a small plant produced by *spontaneous generation*, and rapidly decaying. He called the plant *Aerophytum tropicum*. And in precisely the same manner the dust appeared, according to Mr. Darwin's communication, on the sails and rigging of the ship in the dew of the morning, and contains the above mentioned sixty-seven flint-earth organisms. [ 5 ] On drying the sails, the wind blew the dust rapidly away. The *Aerophyta* were therefore, perhaps, only the dew-pearls."

*Abstract of the Organic Forms of the Atmospheric Dust in the Atlantic Ocean till Feb.* 1845, *&c.*, *&c.*, *&c.*

[ pp. 5, 6, 7. ]

## III.

[ 7 ] "*About an Atmospheric Dust which fell in Malta on the* 15*th of May*, 1830*; its contents of Microscopic Organisms, and its similarity to that of the Atlantic Ocean, near the Cape Verd Islands.*

[Communicated Nov. 20, 1845.]

"Mr. Charles Darwin has sent a new atmospheric dust for investigation, which Purser R. G. Didham had collected on the ship Revenge, on the 15th of May, 1830, at Malta. Mr. Didham had first given this sub-

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stance to Mr. Lyell, who gave it to Mr. Darwin, and the latter to me. I received the original package now before me in white letter paper, with the inscriptions of the different owners. By the collector it is remarked that the atmosphere was at the time orange yellow and thick, and that the collected dust fell down with a shower of rain. The wind was E. S. E. Moreover, he remarks, that he was in the same ship on the 15th of May, 1834, in Palmas Bay, near Sardinia, and observed the same phenomenon.

The microscopic analysis of this (perhaps sirocco?) dust from Malta, which is also of a reddish color, has given the following contents of microscopic recognizable organisms, &c. [p. 8.]

[8] There are 15 Polygastrica, 21 Phytolitharia, 7 Polythamia—43 kinds in all.

Of these 43 kinds, all marked with asterisks (31 in number), have been similarly observed in the dust of the Cape Verd Islands, as may be seen from the previous communications.

There are, therefore, in the earlier and this last result of the atmospheric precipitation 31 similar kinds, and 12 are observed at Malta, which did not occur in the dust of the Atlantic Ocean. Among these 12 forms there is again very probably one which hitherto has only occurred in Chili: *Synedra Entomon*? On [ 9 ] the other hand, there is a flinty plant which as yet has been only observed at Ascension, South Africa and India: *Lithostylidium Taurus*. The *Discoplea* is a hitherto unknown and not yet completely ascertained form. Most decided of all are the numerous Polythalamia and some sea-needles.

The conclusions to which we are *compelled* by these observations are in my opinion the following:

1. It is exceedingly striking that the dazzling white sand of Sahara in Africa, which the E. S. E. wind should carry to Malta, comes down there exactly as that which should come from Senegal to the Cape Verd Islands, orange-colored, giving to the whole atmosphere the same hue, and very clearly owing its color to sundry iron oxides (Gallionellen?) In the Sahara of eastern North Africa, I have myself for six years seen the sand-surface only blinding-white (of chalk and sand-plains), and other travellers have reported the same. The fine dust of the Chamsin I did not see orange-colored; it was always gray.

2. I have indeed also observed in Africa many of the organisms present in the dust, but of the *characteristic* African forms which are present there are altogether too few. *Lithostylidium Taurus* is common to Asia and Africa.

3. Besides the want of purely African forms, and the agreement in many general wide-spread forms, the meteor-dust of Malta is also strikingly like that of the Atlantic Ocean in this respect, that both contain predominantly fresh-water species, and that marine species, not readily supposable in the inland countries, are mingled in with these. The intermingled Polythalamia, which are more common in the Malta dust, belong to a chalk sand, since three of them are identical with chalk animals; but others are not known in the chalk, and these spongoliths all belong, together with the chalk animalcules, to the present epoch.

4. Moreover, the commingling in the contents of the organic matter is, as respects volume, so great in both collections of dust, that we must infer their origin from a common source. *Gallionella granulata* and [ 10 ] *procera*, together with the terrestrial Phytolitharia, predominate in both in the number of individual specimens, and their forms were recognised in every, the smallest part subjected to examination.

5. By the *Synedra Entomon*, as a characteristic form for Chili, we are again brought back to South America.

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6. No trace leads us to volcanic relations of the dust. Neither a melted nor a frozen condition can be perceived. The reddish oxidation of iron is, as is well known, no indication of this.

7. The great geographic extent of the phenomenon of a reddish dust nearly filling the atmosphere, and itself filled with so similar organisms, many of which are characteristic for South America, not merely allows, but demands, more earnest regard to the probable cyclical relations in the upper and lower atmosphere, whereby very great masses of fixed terrestrial matter, earths and metals, and especially flint-earths, chalk, iron and coal, apparently heterogeneous, and yet related by certain peculiarities, are held swimming in the atmosphere, now like clouds thinly spread by whirlwinds or electricity over a broad space, and now condensed and (like the dust of the fir blossoms) falling in showers in every direction.

8. The showers with E. S. E. wind, and the thick orange-colored atmosphere, may be caused by accidental rain-clouds in the sirocco, and have no necessary connection with it.

9. The following questions now appear to obtain importance: Is the sirocco of southern Europe, which hitherto has been taken for the hot wind of Sahara (the continuation of the Samum or Chamsin), but which in its dust shows characters apparently foreign to Sahara and Africa, is this always and to the same extent laden with iron and infusoria? Can such a phenomenon have its rise from known regions of Central Africa?

The scientific answer, either affirming or denying, can of course be only the result of continued inquiry."

[ 11 ] IV.

"*About the Sirocco Dust which fell at Genoa, on the 16th of May*, 1846, *its Organic Composition, and great similarity with the Atlantic Meteor-dust.*

[Communicated June 11, 1846.]

"The Sicilian and Genoese sirocco-storms in May, 1846, have, with much misfortune brought also a peculiar scientific gain.

On the 16th of May, according to a letter sent to me from Professor Pictet, at Geneva, an atmospheric dust fell, which covered the roofs and streets of the city in great abundance. A friend had sent to Mr. Pictet a specimen, and on the 30th of May I received it in Berlin for examination and comparison with the previously-mentioned kinds of dust from the atmosphere.

This specimen, carefully preserved in white paper, is of a pale yellow ochre color, and microscopic analysis has detected therein the following organisms of the smallest type of life:

*Meteor-dust of the Sirocco of Genoa, May* 16, 1846.

A, &c. &c. (pp. 11, 12.)

[12] The open-printed forms (6 in number) are peculiar to the meteor-dust of Genoa.

This result of such a rich organic mixture is indeed no longer surprising, but yet, for many reasons, of great interest. Previously, in the communication respecting the meteor-dust of Malta, attention was called to the still undetermined character of the European sirocco-dust, and the remarks published at that time seem to have incited this recent communication.



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Hereby we have obtained the first direct experience that the European sirocco-dust, which had been traced back as from Africa, brings with itself the meteor-dust of the Cape Verd Islands, and a common form has been already directly known through the dust of Malta.

The kinds of dust fallen since the year 1830 in the Atlantic Ocean, near the Cape Verd Islands, in Malta and in Genoa, all agree in the following characters:

1. They are always of a yellow ochre-like color, not grey like those of the Chamsin in North Africa.

2. This yellow color is produced by iron oxide.

[13] 3. They contain from $\frac{1}{6}$ to $\frac{1}{3}$ of their mass of determinable organic parts.

4. The organic intermingled forms are partly flint-shelled remains of polygastric infusoria, partly fragments of flint-earth plants *(Phytolitharia)*, partly carbonaceous but uncarbonized fragments of other plants, and partly chalk-shelled *Polythalamia.*

5. Of the now determined 90 kinds of such organisms, the greater part occur similarly in the dust which fell at points geographically far apart.

6. Of the 46 species in the Genoese dust, only 11 are wanting in the previous collections.

7. The predominant forms, numerically, are the fresh-water and land forms; but the dust which fell in the ocean at the Cape Verd Islands at Malta and Genoa,* contains also marine animalcules, so that it appears to have been brought from a coast-region, or to have been mingled in the atmosphere with predominating fresh-water forms. *Diploneis didyma* is a decided marine form in the dust of Genoa; *Spongolithis Fustis* a probable one.

8. Above all, especially striking and remarkable is the manner in which all these kinds of dust are so mixed, that not only infusoria and the similar kinds are in them, but that in all the same species predominate, as regards the number of individuals. Thus again, in Genoa, the *Gallionella granulata* and *procera* have appeared as the principal forms.

9. None of these kinds of dust have as yet presented living forms dried up in them. They were always empty shells and fragments.

---

* Where rain-dust is found in the Northern hemisphere, if a line be drawn thence in a direction about S. W. or W. S. W. to the S. E. trade wind region, it will pass near the localities whence according to theory the rain-dust should take its rise.

The air which the S. E. trade winds discharge into the belt of equatorial calms, after ascending, would, if it pass into the Northern hemisphere, take, in the upper regions, on account of diurnal rotation of the earth, a direction very nearly opposite to that of the N. E. trade winds; that is, it would appear to come from the southward and westward, and to go to the northward and eastward, and this is the direction of the valleys of the Oronoco and Amazon, and other parts of the trade wind regions of South America, from all the localities whence specimens of the rain-dust, examined by Professor Ehrenberg, should come.

Hence the same atmospherical current which conveyed the South American infusoria to the Cape Verd Islands might convey it to Malta and Genoa, and should the distinguished microscopist have an opportunity of examining rain-dust from that extensive system of river basins which is drained into the Black Sea, particularly the Southern portion of it, I should expect such examination to give the same general results which the rain-dust of Malta, Genoa, and the Tyrol give. On the other hand, if rain-dust be ever known to fall near the Cape of Good Hope and in Southern Africa, it is probable that the microscope would detect in it the sirocco-dust and infusoria from Sahara, Senegambia, and other parts of Africa, within the zone of the N. E. trade winds.

In like manner, in the rain-dust of New Holland, if rain-dust fall there, should be found infusoria of India; and in certain parts of India, Polynesian forms.—M.

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10. None of these kinds of dust have exhibited molten, frozen, or carbonized forms. They are loose particles dried without heat.

11. And the dust of Genoa, notwithstanding its direction from Africa (as indicated by the sirocco), has shown as few characteristic African forms, such as are contained in every small mud-particle in Africa, as were found in any of the previous dust. On the contrary, the *Synedra Entomon*, a characterizing form of South America, is here present.

[14] It must also not remain unremarked, that the seeds of the burnt mushroom *(Phragmidium)* are intermingled with the meteor-dust of Genoa. Moreover, it is worthy of notice, that the European observations, hitherto so few, have been always made on the 15th and 16th of May, in different years (at Malta, Sardinia, Genoa.)

A chemical analysis of the meteor-dust of the Atlantic Ocean has been made by Mr. W. Gibbs of New York, in Mr. H. Rose's laboratory.

| | | Independent of Water and Organic matter. |
|---|---|---|
| Water and organic matter | = 18.53 | |
| Flinty earths | = 37.13 | = 45.575 |
| Clayey earths | = 16.74 | = 20.547 |
| Iron oxide | = 7.65 | = 9.388 |
| Oxide of manganese | = 3.44 | = 4.222 |
| Carbonic acid chalk earth | = 9.59 | = 11.648 |
| Talc earth | = 1.80 | = 2.209 |
| Alkali | = 2.97 | = 3.645 |
| Natron | = 1.90 | = 2.332 |
| Oxide of copper | = 0.25 | = 0.306 |
| | 100.00 | 100.00 |

The greater part of the flint earth comes evidently from including the Polygastrica and Phytolitharia; the large amount of iron from the Gallionella, since these predominate, and thence perhaps also the manganese. The carbonic acid chalk earth corresponds tolerably well to the smaller number of Polythalamia. The clayey earths may be there as foreign dust. Alkali, natron, talc earth, copper, are chemical, small, microscopically not very certain contents.

The following review illustrates the extension of the same meteor-dust, according to our present experience:

In area. { The Atlantic Ocean to 800 nautical miles west of Africa, Cape Verd Islands, Malta, Genoa, } Substance similar.

In time: 1830! 1834! 1836? 1838! 1846!

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Therefore, this yellow meteor-dust has for 16 years, and at great geographical distances, shown a constantly uniform character.

[15] Although far from attaching any weight to a hypothesis, yet I consider it a matter of duty to seek for a connection in the facts, and feel myself therefore urged on and compelled, on account of the above-mentioned particulars, and so far as they will justify a conclusion, to suppose an atmospheric current, joining America and Africa in the region of the trade winds, and sometimes, particularly about the 15th and 16th of May, turned towards Europe, and bringing with it this so peculiar, apparently not African dust, in countless measure. If we will not attack hypothesis by hypothesis, but rather with united effort add scientific observations upon observations, then will the explanation of these mysterious relations, so intently claiming our study, progress rapidly."*

## V.

## " *Communications respecting the Microscope Analysis of the Sirocco dust and blood-rain which fell on the 17th of October*, 1846, *in a violent hurricane at Lyons.*

[Communicated 1846–47.]

"By the results gradually published during the last two years of investigation of different kinds of meteor-dust, whereby the action of the sirocco has been brought into nearly direct connection with phenomena of the distant Atlantic Ocean, Dr. Lortet of Lyons has been induced to send for my examination a specimen of the sirocco-dust, which fell on the 17th of October, 1846, at La Verpillière between Lyons and Grenoble, in the destructive hurricane of that date. His letter, of the 28th of October, contains the following brief picture of the attending circumstances:

" The storm came over the mountain chain of the Ardèche District, with a N. W. wind. At the same " moment, about 7 a. m. of the 17th of October, the sky was extraordinarily clouded over Grenoble. We had at " the same time the suffocating blast of a S. E. sirocco. Simultaneously with the bloody kind of rain, fell the " enclosed very rich red dust by which the post-carriage was covered to the depth of one or two lines. " [16] The hurricane was remarked at Lyons, only at evening from six o'clock till midnight, and the fall of dust " was noted from 6½ to 11½ o'clock, (as in the districts of Isère, Drôme and Ardèche). The rain was not ex- " cessive, but the sky was terrible. There were two divisions of the storm, one in the South, the other in the " Northwest. The wind changed from minute to minute. Flashes of wonderful size streaked through the sky, " not vertical but horizontal, and passed over more than one-third of the circumference. At every flash the " birds of passage on their flight redoubled their despairing cries. In the streets, in the open chambers, on " the pavements were caught ducks, quails, juniper-birds, black-birds, nightingales, fly-catchers, &c., &c."

All the materials for a communication respecting the details of the hurricane were collected in Lyons. A chemical analysis made there of the dust had shown as chemical constituents, flint-earth, carbonic acid, chalk, and oxide of iron. The specimen of the fallen dust enclosed in the letter, was very carefully and closely folded in fine letter paper, packed very judiciously, and in volume about equal to three peas.

* See concluding remarks by M.

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This dust collected near La Verpillière, not far from Lyons, has exhibited the following characteristics:

1. In color the very fine dry dust was ochre-yellow, on moistening with water it was rust-red, clearly ferruginous.

2. By the smallest motion it was immediately scattered, and its particles were more mobile than those of meal.

3. The mechanical collection appeared under the microscope as composed of very different substances, but with no decided volcanic particles. Very fine sand-like fragments of quartz and irregular reddish particles with a still finer yellowish mould composed the principal mass, in which so many definite fragments of small organic bodies lay strewn, that every most minute grain of dust contained some of them.

The following 73 species are determined and clearly fixed.

Polygastrica 39, &c., &c., [pp. 16, 17.]

[18] This mixture of known and fixed corpuscules amounts to about $\frac{1}{8}$ ($12\frac{1}{2}$ per cent.) of the whole volume. Whether the remaining part of the principal mass is of organic origin or is yet to a great extent composed of organic flint and chalk animalcules changed past recognition, cannot be determined. But in particular, the suspicion arises that a part of the yellow corn-like very fine solid mould perhaps belongs to the *Gallionella ferruginea*, but it cannot be clearly enough recognized.

Whoever adopts the first unscientific impressions may say it is self-evident that in the dust of the surface, wheeled up and carried about by a hurricane, there must be all kinds of microscopic organisms, and in the necessary limitless variations of these, it were not worth the trouble to point out each distinctly.

By deliberate scientific investigation, however, the following circumstances have been here noticed as remarkable:

*a.* The meteor dust fallen near Lyons, (La Verpillière,) like those previously investigated from Genoa and Malta, does not at all resemble our ordinary atmospheric and storm-dust, which in Europe, by reason of the seldom failing moisture and the predominant character of soil, has, when dry, a more or less gray color, and only in limited localities, where the surface is without moisture, it appears so seldom reddened by clay or iron oxide, that it has not yet attracted the attention of meteorologists, much as they have occupied themselves about sulphur rains, and such things.

*b.* The meteor-dust of Lyons has, by its rust-yellow, and when moist, rust red color, by its great fineness as well as by its chemical and mechanical composition, precisely the same character as that which falls in the Atlantic Ocean regularly, and without any hurricane, as in the trade winds; and in this character the dust which clouded the whole atmosphere, and fell at Malta in 1834, and at Genoa on May 16th of this year, (1846,) agree, as already stated.

*c.* This agreement in character not only obtains in general, but in particulars, in a very striking manner as follow:

1. The sirocco dust of the 17th of October shows firstly, in its composition, the more seldom marine animalcules [ 19 ] mingled with prevailing microscopic fresh water organisms. There are as yet five decided marine forms discovered therein.



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Flint-shelled polygastrica, &c., &c.

Moreover, there are six bodies possibly belonging also to the sea water, of which the genera, however, live also in fresh water, all *Polygastrica*, &c., &c.

There are then, perhaps, 11 among the 73, and certainly 5 to 8 marine forms, the remaining $\frac{3}{4} - \frac{6}{7}$ are decided fresh water forms of terra firma.

2. As in the Atlantic meteor-dust, so also in that of Lyons, the Phytolitharia are very numerous, which points to important conditions in the relations of the terrestrial surface, and the residue of vegetation, and *contradicts the formation of the substance in the atmosphere itself.*

3. The forms more frequently predominating in the number of individuals in the Lyons dust are—

Polygastrica, &c., &c.

These very forms are not merely present, but always, or mostly, predominant in the eight previously noted kinds of Atlantic dust.

4. Of the 73 forms of the Lyons dust, 51 have been already noted in the previously analysed kinds. In all the nine kinds, four forms are similarly present. Polygastrica 3, &c., &c.

[20] The Lyons dust has 24 forms, agreeing with the six kinds of Atlantic dust, and differing from those of Malta and Genoa. In at least two-thirds of all the nine kinds of dust, there are 15 forms in addition to the four common to all.

Polygastrica 5, &c., &c.

*d.* There are 21 peculiar forms only observed in the Lyons dust, and not in the other collections, as follow:

Polygastrica, 14, &c., &c. (pp. 20, 21.)

[21] Among these 21 forms, there are only two wholly new ones, so well fixed that they are determinable, *cocconeis atmospherica* and *eunotia? lævis;* and perhaps, also, the three fragments which all belong to unknown forms. Moreover, the neatly-lobed vegetable scales seem, on account of their peculiarities, to require to be placed among the non-European forms. The remaining fifteen forms are entirely similar to others previously known.

*e.* The principal mass of all these 73 forms is European; many are also recognised as from other parts of the world. No form is characteristically African; but again, there are two which seem to be characteristic for South America.

*Eunotia Pileus. Hymantidium Zygodon.*

Since the forms observed only in the Lyons dust, and occurring generally only in dust of this kind, denote no terrestrial father-land, there should be, perhaps, among them a further classification. There are seven of these:

Cocconeis atmosphærica,
Coscinodiscus, &c. (p. 21.)

The *Eunotia Pileus* is less accurately determined as an American form, according to the investigations hitherto made, since it has now recently been observed once in Spain; but this latter is only a specimen of one

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dead shell, and in Guiana it has been observed in numberless collected living specimens, consequently much more probably from here than from the former place.

*f.* That the red dust in its mingling with the rain on the 17th of October formed a blood-like water, as the journals repeatedly informed us, is only worthy of notice as being the first time that this blood-colored kind of meteor has been directly observed.

*g.* The fact is very especially remarkable in this fall of dust, that, notwithstanding its agreement with the [22] Atlantic dust, which always showed dead and empty shells of organisms, the *eunotia amphyoxis has often been found with its green ovaries, and therefore capable of life.*

The following are the general results and characteristics of the new sirocco dust:

1. The dust of the sirocco hurricane of the 17th of October, 1846, at Lyons, differs from the ordinary European and North African dust, but agrees entirely with the meteoric dust which, since 1830, have been observed in the Atlantic Ocean, near the Cape Verd Islands, and in the sirocco at Malta and Genoa. The specimens of all these kinds are as though taken from one and the same well-mixed package of dust, although their highly various origin, and their innumerable multitude, are perfectly demonstrated.

2. Besides the direction of the wind, (which, according to the most recent and fortunate collections and conclusions of meteorologists (Dove) gives no indication of the source of the storm,) no internal nor external evidence of the dust pronounces for its origin in Africa, but there are many forms there chiefly or wholly native to South America.

3. Moreover, the Lyons dust cannot have arisen from the far interior of a continent, but only from a coast region, if it have generally a single origin, since it contains marine forms now living.

4. The contents of this last sirocco dust are again not only like those of the very distant Cape Verd Islands, but even so very like what has fallen there for sixteen years, that the difference is far exceeded by the agreement, and seems only to lie in the defect of our knowledge.

5. A so uniform mixture, in such great numbers and so great intervals of time and space, can arise, even though the investigations include so few occasions, neither from one limited place, where, indeed, varying moist seasons produce varying organisms, nor generally can it be an unimportant instantaneous upraising of a local dust by whirlwind. It appears to belong necessarily to a more constant series of relations, a constant [ 23 ] cloud-dust swimming in the atmosphere, and always receiving new contents, which a hurricane accidentally meeting may scatter in any direction.

6. In how far certain historical kinds of thick fog, (of course excepting that arising from peat fires,) coincide with the phenomenon, we cannot now decide; but it may be useful to point out the possibility of such a coincidence.

7. The whole number of organic corpuscules detected in the nine kinds of dust yet known, and so strikingly similar, amounts now to 19 species, namely:

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| | |
|---|---|
| Polygastrica, | 57 |
| Phytolitharia, | 46 |
| Polythalamia, | 8 |
| Particulæ plantarum molles, | 7 |
| Insectorum fragmenta, | 1 |
| | 119 |

Of these, seventeen kinds, - - - - - - 8 Polythalamia,
" " " - - - - - - 7 Polygastrica,
" " " - - - - - 2 Phytolitharia, (spongolithides,)

belong to the sea water; the remaining 102, with the exception, perhaps, of the few new kinds, are fresh water forms.

8. *Living forms have been brought in the more recent dust*, which, however, gives no scientific negative to the idea of an extensive sphere of life in the atmosphere. The cotemporaneous phytolitharia are earth-forms—parts of not independent plants.

9. The dust bears no trace of volcanic action.

10. Simultaneously with the falling rain, it produces the appearance of red water (blood-like to excited dispositions.)

11. The sirocco of Southern Europe, often producing disease, and accompanied by a dusty orange-colored atmosphere, seems evidently, as I had previously suspected, to spread the Atlantic organic dust regularly (Malta, Genoa, Lyons,) wide over Europe.

May these facts yet continue to awaken interest in this subject among scientific men, especially those in nautical life. The terrestrial origin of remarkable meteors connected with atmospherical dust-clouds, or great storms, becomes, through microscopic analysis of the dust, so certainly and so immediately determined, that a [ 24 ] scientific, and in other respects a highly interesting terrestrial and ultra-marine telegraph may sometimes be made use of, as has recently taken place, and previously, in 1845, in the case of Hecla."

## VI.

### "*About a New Specimen and Analysis of the Sirocco-Dust of the 16th of May*, 1846, *from Genoa.*

[Communicated, 1846.]

"M. L. Von Buch delivered to me a few weeks since, at a session of the Academy, a new specimen of the sirocco dust of May 16 of this year, which the Director of the Navigation School in Genoa, General the Duke of Marmora, Corresponding Member of the Academy, had perceived to be worthy of a more accurate analysis, and had given over to him. [Among the characteristics] of this dust were noted the following: 4. *Synedra entomon*, as a South American form, *Discoplea atmosphærica*, are characteristic in the Lyons and Maltese [ 25 ] dust. * * * These seven forms (new in the Genoese dust) are not peculiar, but have been before pointed out in the Atlantic and South American dust of the atmosphere.

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## VII.

### "*About the Red Snow with the Fohn Wind in Pusterthale, in Tyrol, on the 31st of March, 1847; its peculiarities, and very remarkable relationship to the Atlantic Meteor Dust.*

[Communicated in 1847.]

"On the 31st of March, 1847, there fell at St. Jacobs, in Defferegggen, (Tefferecken,) with a south wind, [ 26 ] between ten and eleven at mid-day, a colored snow, which gave the whole wintry region a peculiar tint. An attempt was made to collect this strange substance, and a large amount of an uncommonly fine earth was obtained, which when dry was tasteless, and was intermingled with an extremely fine glittering sand-dust, and appeared of a brick color."

[27] Mr. Jos. Oellacher made a chemical analysis of the dust and "on account of the intermingled vegetable-wool and organic matter filled with nitrogen, believed the dust to be of terrestrial and not of cosmical origin.

Mr. Oellacher obtained, moreover, the result that the red Sahara-dust (brought from Africa) contains almost precisely the same elements as the above snow-dust. Thus he believed that he had, for the first time, directly proved the true African nature of the sirocco-dust.

[28] Since microscopic investigation has for a long time given a result entirely different from this chemical one, it appeared to me to be of very great scientific interest to endeavor to ascertain whether the difference was in the substance itself or in the mode of investigation, since (if the latter) very similar phenomena might be produced by wholly different causal conditions and elements, the deciding of which would here be of peculiar scientific interest."

Ehrenberg finds that the identity of the two kinds of dust is not established by the above-mentioned chemical investigation, and indeed that such investigations may not be expected necessarily to decide such a question. He then proceeds (pp. 28 – 36) to give the details of his own microscopic examinations, and finds among other things the following:

[36] 8. "All the forms have certainly the character of European genera, and the most are European species; yet most of them also are found in American localities, and less frequently in African. Comparing now the dust of this year (1847) from Tyrol, with the sirocco-dust of Malta, Genoa, and Lyons, previously described, and with the previously analysed meteor-dust of the Cape Verd Islands and the Atlantic, we obtain the following highly remarkable relations.

1. The color and the whole exterior in all characters, fineness, adhesiveness of parts, weight, are not in the dry Tyrol snow-dust as in the ordinary atmospheric dust of storms, but entirely and wholly similar to the sirocco and Atlantic dust. 2. The organic contents which so highly characterize the Atlantic meteor-dust, and are similarly found in the sirocco-dust, are also found to agree in a very remarkable manner in the snow-dust.

[38] 5. That the Fohn wind and sirocco always appear as the continuation of the West India whirlwinds is, by the new rotatory theory of storms, and in contradiction of the old opinion that they came from Africa, now become highly probable, and the fact can be proved, and made scientifically certain, by this specially moved dust. That however the explanation is not yet fully conclusive, will appear from the following remarks:



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The already published analysis of the meteor-dust, fallen from 1830 to 1847, in the Harmattan or Trades, [ 39 ] Sirocco and Fohn, show a great similarity in the intermingling of organic particles. Such an intermingling might be expected, *a priori*, from every storm. But that in all, *similar* particles, and *great numbers of different particles, should similarly occur*, is very striking, and becomes yet more so when we consider *that for* 17 *years, and in different times of the year, they remain so similar that even the predominating forms, numerically, of one kind of dust, are also the predominating forms in all the rest.* That materials existing on the surface of the earth are so similarly carried about by storms is not supposable, if we give up the highly improbable notion that all the hitherto investigated meteors and storms had their origin at precisely the same limited locality of one and the same country. Wherever life is found, the seasons of the year or of rains alternate, and with them alternate, not only in theory but according to my own frequent and direct experience, either the mode or the number of individual living forms. Considering the intermixture of marine animals, their constant similarity in number, and the always recurring predominance of the same forms, we see that no possibility remains of supposing that the meteor-dust, which the European sirocco and the German Fohn wind bring, and which covers the Atlantic Ocean *only in the region of the trades*, even in the European winter (January and February), should *always originate directly from the West Indies.* Impossible as it is to conceive of all the storms now compared from 1830 to 1847, as having a continuous genetic connection, it is equally impossible also to imagine the masses of dust transported by them, with such a degree of similarity, *not to have a genetic connection.*

It appears, therefore, as had been directly pointed out previously in November, 1846, now to become even the more necessary to suppose *a dust-cloud to be held constantly swimming in the atmosphere by continuous currents of air, and lying in the region of the trade winds, but suffering partial and periodical deviations.* This will remove every difficulty, from the fact that all the accurately-observed siroccos and Fohn winds, notwithstanding the different years and seasons of year, always show the same intermingling of meteor-dust. [ 40 ] On the other hand, notwithstanding the commingling of South American forms, we cannot necessarily suppose that all the siroccos and Fohn-winds must take their origin from a single locality in the West Indies, entirely different from their direction, which is from the South, nor that they must always partake of the nature of whirlwinds. It necessarily remains only on account of the dust they bring to assume that they commence in the region of the trade winds, and it is uncertain whether in the neighborhood of Africa or America. Since the true trade wind scarcely touches the continent of Africa, they could not have come immediately from its surface, but might well come from America, whence originally the mass of the transported dust brings the characteristics with it. In such relations, it will no longer appear strange that the yellow meteor-dust of a storm in Beloochistan, observed by Mr. Pottinger, should possess the same contents, and belong to the same class of substances without necessarily supposing that Asiatic storm to have commenced in Cayenne or the Antilles.

[41] 9. The opinion presented to the Academy in November, 1846, respecting the meteor-dust that fell with the sirocco storm at Lyons, on the 17th of October, its intermixture of 73 described organic parts, and their

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probable connection not with Africa, but with Guiana in South America, has found a further decided support in the recently published and thorough investigation of the course of the hurricane, by Mr. Fournet of Lyons. Immediately under date of the 3d of January, after sending my results enclosed in a letter, Dr. Lortet informed me that according to the investigation of Mr. Fournet, the hurricane of the 11 (9 Oct.) in the Havanna, Grenada, St. Vincent, Martinique, and probably also at Oyapack in Cayenne, appeared to have formed the beginning of this storm. So, therefore, *microscopic analysis had previously determined the point of origin of the substance with unexpected accuracy.*

[43] 10. Very probably the meteor-dust which fell with rain on the 31st of March, 1847, at Chamberes, in Savoy, the account of which appears in the Appendix to Mr. Fournet's excellent Treatise on the Lyons Dust (pp. 97, 98), is the same phenomenon with the Tyrolese snow-dust, whereby the extent and direction of the storm becomes more unlimited, and it receives also the peculiarity that *they were only connected by clouds*, since no dust-fall was observed in the intervening countries. (And if the observation of General Scott, also quoted, p. 100, according to which, from the 23d to the 28th of March, 1847, at the siege of Vera Cruz, a dust-bringing* hurricane raged from the N., be supposed to refer to the same storm, we shall then have the same event directly observed in America.)"

## VIII.

### "*About the cinnamon, and brick-colored Meteor-dust, sometimes accompanied by fire balls; new Examinations, and proof of similar organic composition in this dust for 44 years; and some inferences respecting it.*

[Communicated in 1847.]

"Within a few weeks, new materials have accumulated for the investigation of the reddish and brown-yellow atmospheric dust, of which the Academy has been informed for three years, and which last appeared as the red snow-dust in Tyrol. As the examination appeared to possess general scientific interest, I now bring forward the results."

Ehrenberg then gives the microscopic analysis of two specimens of dust, one of which fell in 1813, in Calabria, and the other in 1803, in Italy and Sicily. He finds the same general results as quoted above for the other specimens, viz. several species peculiar to South America, and none peculiar to Africa.

### *Review of results and Suggestions.*

[163] "The more I have busied myself with these examinations of atmospheric dust, the more confident have I become that the subject is of great, manifold and rapidly-increasing import; that it conflicts with not a few important and weighty ideas, and draws out and establishes other new and important scientific notions. This is but the beginning of a future great department of knowledge. I hope that the following attempt to deduce results from the observations which I have collected with some trouble and very great care and circumspection, may not lead to giving too great prominence to what is unimportant, nor fail to place what is important in a light that may suggest farther and correct investigations.

* Was not the dust of this Norther, from the sandy beaches of the Mexican coast?—M. F. M.

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1. The phenomena here collected, under the name of trade-wind dust, have been hitherto known as dust-hurricanes, red dust-rain, red volcanic-ashes-rain, &c. &c.

[164] 2. The name trade-wind dust was here first applied to the Atlantic meteor-dust. The connection of this with the trade wind, and not with the harmattan, was definitely pronounced in 1816 by Captain Tuckey; it was made known and published from the Prussian merchant-ship, Captain Wendt, in 1830; in 1837, by Bennett; and in 1839, by Captain Hayward. And Admiral Roussin separated the constant coast-cloud from the periodic harmattan, in 1817.

[166] 5. In the microscopic analysis of this dust, fresh water and land forms are by far the most predominant. Only the following genera belong alone to the sea-water:

| | |
|---|---|
| Coscinodiscus, | Grammatophora, |
| Diploneis, | Biddulphia. |
| Goniothecium, | |

And beside these, all the Polythalamia and some spongoliths are sea formations. Sp. Clavus, cenocephala Caput serpentis, obtusa, robusta.

Known African characteristic forms are not to be found. The great number of forms are found in various parts of the world, even in Europe and Africa. The following are American:

| | | |
|---|---|---|
| Arcella constricta, | Eunotia quaternaria, | Stauroneis dilatata, |
| Desmogonium guyanense, | quinaria, | Surirella peruana, |
| Eunotia Camelus, | Gomphonema Vibrio, | Synedra Entomon, |
| depressa, | Himantidium Papilio, | Fragmenta incerta, |
| Pileus, | Zygodon, | |
| | Navicula undosa, | |

6. There is in Africa no trade wind and no surface of red dust which can supply the trade wind. The sand of the Sahara is white and gray; the cloud-dust of the trades is cinnamon-colored. Since, according to experience, an upper trade wind corresponds with the lower at the Peak of Teneriffe, and since the lower is not an African wind, but different from the harmattan, it follows that only the upper wind can carry the dust to Africa; and since probably it does not continue beyond, falling there, and becoming the lower trade wind, it precipitates the dust in that region. The fact that South American forms have been observed in the dust of the trade winds gave rise originally to this theory, and is still favorable to it, and moreover the number of these forms continually increases. The American dust, therefore, raised up in the region of equatorial calms and ascending (South American) currents of air, and carried by the upper eastward trade winds to Africa, by this vertical downward current, is returned to America through the lower western trades, unless it have been previously deposited in space.

[167] 8. That this dust is coarsest near Africa may be explained by this direct sinking down in that region, while lower in the ocean it is more sifted out; but the dust of March 9, 1838, is not coarser than that from San Jago in the Cape Verd Islands, in 1833. Thus, the place of falling down may always show the coarsest parts.

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[168] 10. It is worthy of remark, that North America is seldom reached by the dust, and no ship in the Pacific Ocean, whence we may conclude that the constant dust-cloud zone of the upper atmosphere truly belongs only to the Atlantic Northern trades; and over America, when it begins to appear in the South, wholly fails in the North, as over the Sandwich Islands, and consequently cannot be brought down by fire-meteors and meteoric stones."—*Vide "Passat-Staub und Blut-Regen, ein grosses organisches unsichtbares Wirken und Leben in der Atmosphäre.—Mehrere Vortrage von Dr. Christian Gottfried Ehrenberg: Berlin*, 1849."

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It is now proved that there is a perpetual upper current of air from South America to Northern Africa; and that the volume of air in these upper currents which flows to the Northward is equal to the volume which flows to the Southward with the N. E. trade winds, there can be no doubt.

The "rain-dust" has been observed most frequently to fall in spring and autumn; that is, the fall has occurred after the equinoxes, but at intervals from them varying from 30 to 50 days.

Now, any one who will take the trouble to consult my "trade wind charts" of the Atlantic Ocean will see that at the time of the vernal equinox the equatorial calms are "raging" between the parallels of 4° N. and 4° S., and that consequently the places between these parallels are then in their rainy season.

The "rain-dust," therefore, it may be inferred, could not well be taken up between these two parallels at such a season. The earth is then flooded with rain, and there prevails a great calm; and as the air is saturated with moisture, and consequently as there is no—little or no—evaporation going on at such a time and place, it is difficult to imagine how any of the microscopic organisms of a locality so situated should be taken up in the atmosphere.

But if the examination of these charts be carried a little farther, it will be perceived that at the time of the vernal equinox, the valley of the lower Oronoco is then in its dry season,—every thing is parched up with the drought, the pools are dry, and the marshes and plains arid wastes. All vegetation has ceased, the great serpents and reptiles have buried themselves for hibernation;* the hum of insect life is hushed; and the stillness of death reigns through the valley.

Under these circumstances, the lightest breeze raising dust from lakes that are dried up, and lifting motes from savannahs that are parched up, will bear them away like clouds in the air.

This is the period of the year when the surface of the earth in this region, strewed with impalpable and feather-light remains of animal and vegetable organisms, is swept over by whirlwinds, gales, and tornadoes of terrific force; this is the period for the general atmospheric disturbances which have made characteristic the equinoxes. These conditions appear sufficient to afford the "rain-dust" for the spring showers.

At the period of the autumnal equinox, another portion of the Amazonian basin is parched with drought, and liable to winds that fill the air with dust, and with the remains of dead animal and vegetable matter; these impalpable organisms which each rainy season calls into being, to perish the succeeding season of drought,

* Humboldt.



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are perhaps distended and made even lighter by the gases of decomposition which has been going on in the period of drought.

May not, therefore, the whirlwinds which accompany the vernal equinox sweep over the lifeless plains of the lower Oronoco, take up the "rain-dust" which descends in the Northern hemisphere in April and May; and may it not be the atmospherical disturbances which accompany the autumnal equinox that take up the microscopic organisms from the upper Oronoco and the great Amazonian basin for the showers of October?

If there be reason in this question, and plausibility in the answer it suggests, an affirmative reply would authorize us to infer that the "father-land" of the "rain-dust" is one place for the spring and another for the autumn, and therefore it might be expected that the microscope would detect certain infusoria that are peculiar each to its own dust and locality.

These are the periods and these the conditions most favorable for raising the "sea-dust," and may we not therefore refer to these conditions, and suggest that in them is to be found reason for the greater liability of the "rain-dust" to fall in April and May, October and November, than at other times.

If one season of the year be most favorable to the taking up of the infusoria, another season may be most favorable for letting them down again. The charts indicate the former, the microscope shows the latter to be the case.

And may we not therefore regard the interval between the time most favorable for the ascent, and the time in which the descent is most liable to occur, as a sort of general indication as to the length of the time required for the transportation? and therefore as to the rate of motion of the atmosphere in its general channels of circulation?

These suggestions as to the taking up the dust in the valley of the Oronoco derive weight from the observations of the closest of observers:

The Baron von Humboldt, in his "Aspects of Nature," thus contrasts the wet and the dry seasons there:

"When under the vertical rays of the never-clouded sun, the carbonized turfy covering falls into dust, the "indurated soil cracks asunder as if from the shock of an earthquake. If at such times two opposing currents "of air, whose conflict produces a rotary motion, comes in contact with the soil, the plain assumes a strange "and singular aspect. Like conical shaped clouds, the points of which descend to the earth, the sand rises "through the rarified air on the electrically-charged centre of the whirling current, resembling the loud water-"spout, dreaded by the experienced mariner. The lowering sky sheds a dim, almost straw-colored, light on "the desolate plain. The horizon draws suddenly nearer, the steppe seems to contract, and with it the heart "of the wanderer. The hot, dusty particles which fill the air increase its suffocating heat, and the east wind "blowing over the long-heated soil brings with it no refreshment, but rather a still more burning glow. The "pools which the yellow, fading branches of the fan-palm had protected from evaporation, now gradually disap-"pear. As in the icy north the animals become torpid with cold, so here, under the influence of the parching "drought, the crocodile and the boa become motionless and fall asleep, deeply buried in the dry mud

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" * * * The distant palm bush, apparently raised by the influence of the contact of une-
" qually heated and therefore unequally dense strata of air, hovers above the ground, from which it is sepa-
" rated by a narrow intervening margin. Half concealed by the dense clouds of dust, restless with the pain
" of thirst and hunger, the horses and cattle roam around, the cattle lowing dismally, and the horses stretching
" out their long necks and snuffing the wind, if haply a moister current may betray the neighborhood of a not
" wholly dried-up pool. * * * * * * *

" * * * At length, after the long drought, the welcome season of the rain arrives; and then
" how suddenly is the scene changed! * * * * * *

" * * * Hardly has the surface of the earth received the refreshing moisture, when the pre-
" viously barren steppe begins to exhale sweet odors, and to clothe itself with kyllingias, the many panicules
" of the paspulum, and a variety of grasses. The herbaceous mimosas, with renewed sensibility to the
" influence of light, unfold their drooping, slumbering leaves, to greet the rising sun; and the early song of
" birds, and the opening blossoms of the water-plants, join to salute the morning." * *

The color of the "rain dust," when collected in parcels, and sent to Ehrenberg, is "brick-red;" or "yellow ochre," when seen by Humboldt in the air, it was less deeply shaded, and is described *by him* as imparting a "straw-color" to the atmosphere. In the search of spider lines for the diaphragm of my telescopes, I procured the finest and best threads from a cocoon of a mud-red color; but the threads of this cocoon, as seen singly in the diaphragm, was of a golden color; there would seem, therefore, no difficulty in reconciling the difference between the colors of the rain dust, when viewed in little piles by the microscopist, and when seen attenuated and floating in the wind by the great traveller.

It appears, therefore, that we here have placed in our hands a clue, which, attenuated and gossamer-like though it at first appears, is nevertheless palpable and strong enough to guide us along the "circuits of the wind" into "the chambers of the South."

The frequency of the fall of "rain dust" between the parallels of 17° and 25° N., and in the vicinity of the Cape Verd Islands, is remarked upon with emphasis by the author. It is worthy of remark; because in connection with the investigations at the Observatory, it is significant.

The latitudinal limits of the northern edge of the N. E. trade winds are variable. In the spring they are nearest to the equator, extending sometimes at this season not further from the equator than the parallel of 15° N.

The breadth of the calms of Cancer is also variable; so also are their limits. The extreme vibration of this zone is between the parallels of 17° and 38° North, according to the season of the year.

According to the Charts, this is the zone in which the upper currents of atmosphere that ascended in the equatorial calms, and flowed off to the northward and eastward, descend. This, therefore, is the zone in which the atmosphere that bears the "rain dust" descends to the surface; and this, therefore, is the zone, it might be supposed, which would be the most liable to showers of this "dust." This is the zone in which the Cape Verd Islands are situated; they are in the direction which theory gives to the upper current of air from the

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Oronoco and Amazon with its "rain dust," and they are in the region of the most frequent showers of "rain dust," all of which are in striking conformity with the theory of circulation.

It is true that in the present state of our information, we cannot tell why this rain dust should not be gradually precipitated from this upper current, and descend into the stratum of trade winds, as it passes from the equator to higher northern latitudes. Neither can we tell why the vapor which the same winds carry along, should not, in like manner, be precipitated on the way; nor why we should have a thunder storm, a gale of wind, or the display of any other atmospherical phenomenon to-morrow, and not to-day—all that we can say is, that the conditions of to-day are not such as the phenomenon requires for development.

Therefore, though we cannot tell why the rain dust should fall not always in the same place, we may nevertheless suppose that it does not, in passing the same parallels, always meet with the conditions—electrical and others—favorable to the descent—and that these conditions might occur now in this place, now in that. But that the fall does occur always in the same atmospherical vein or general direction, my investigations would suggest, and Ehrenberg's researches prove.

Judging by the fall of rain dust, we may suppose that the currents in the upper regions of the atmosphere are remarkable for their general regularity, for their general direction and sharpness of limits, so to speak.

We may imagine that certain electrical conditions are necessary to a shower of "rain dust," as well as to a thunder storm, and that the interval between the time of the equinoctial disturbances in the atmosphere to the fall of these showers, though it does not enable us to determine the true rate of motion in the general system of atmospherical circulation, yet it assures us that it is not less on the average than a certain rate.

I do not offer these remarks as an explanation with which we ought to rest satisfied; I rather offer them in the true philosophical spirit of the distinguished microscopist himself:—simply as affording, as far as they are entitled to be called explanation, that explanation which is most in conformity with the facts before us, and which is suggested by the results of a novel and beautiful system of philosophical research.

M. F. M.

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